APPLIED HYDRAULICS

MARCH 1955

THE MAGAZINE OF
FLUID POWER
INCLUDING AIR CONTROLS
AND AIR CIRCUIT DESIGNS
• ELECTRICAL CONTROLS •

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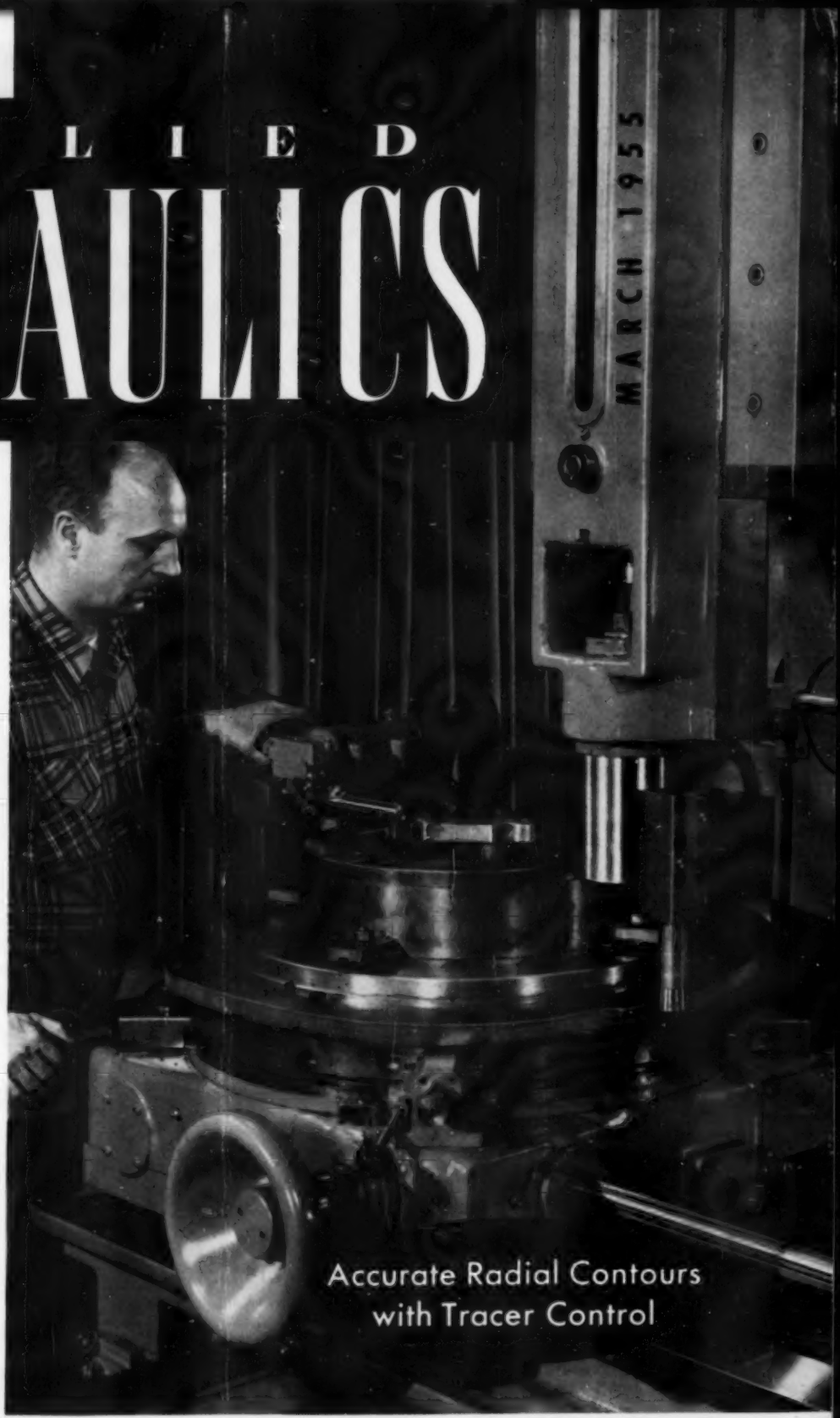
FRANCHISE CIRCULATION

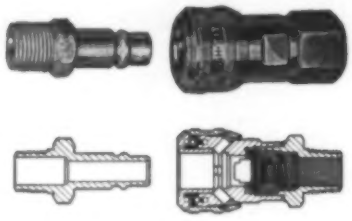


Accurate Radial Contours
with Tracer Control

For information about
the APPLIED HYDRAULICS 1955 Prize Paper Contest
see page 42

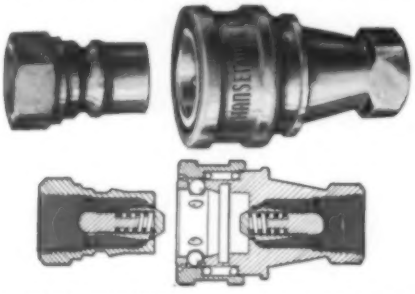
SPECIFICALLY ENGINEERED...
NEVER MERELY ADAPTED...
FOR EACH PARTICULAR
TYPE OF APPLICATION

HANSEN
QUICK-CONNECTIVE COUPLINGS



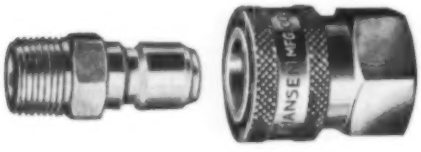
ONE-WAY SHUT-OFF
Shuts off one side of line

Gives quick connection and disconnection, with instant automatic flow or shut-off. To connect Coupling and open line to flow of fluid, merely push Plug into Socket. To disconnect, a slight pull on sleeve releases Plug and shuts off supply end of line.



TWO-WAY SHUT-OFF
Shuts off both sides of line

To connect, pull back sleeve and push Plug into Socket. Identical torpedo type valves permit free flow of gas or liquid through Coupling. To disconnect, pull back sleeve . . . Coupling immediately disconnects, valves automatically seal both ends of line. Female pipe thread connections from ⅛" to 1". Available in brass or steel.



STRAIGHT-THROUGH COUPLING

Provides quick connection and disconnection, but does not have shut-off feature. Sizes, ranging from ¼" to 2½", carried in stock. Two special types of straight-through steam Couplings also available—one for low pressures, and one for high pressures.

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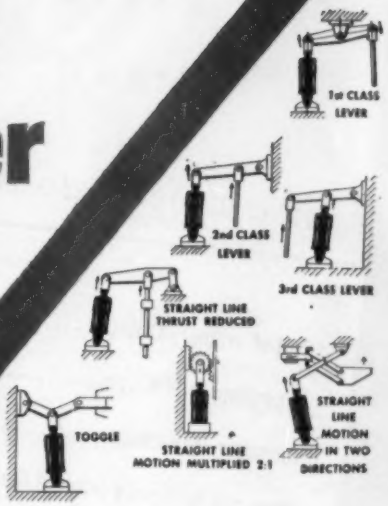
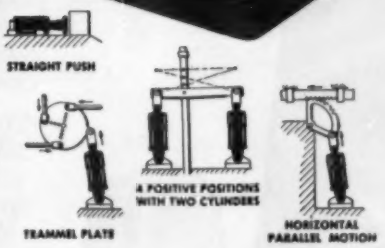


IF YOU HAVE a push, pull, lift, press, clamp or control problem, Hanna Cylinder Power can be the answer. The mechanical movements here illustrated may suggest ways Hanna Cylinders can be used to simplify the actuation and control of machines or equipment and to replace or reduce manual effort.

In the majority of cases, you can select a standard cylinder model to meet your specific requirements from the broad Hanna Hydraulic and Pneumatic lines. Regardless of whether you choose a "standard" or "special" the Hanna label assures you of quality developed through fifty years of concentration on cylinders and their control valves!

here are basic Cylinder Powered MECHANICAL MOVEMENTS that can be put to work for YOU!



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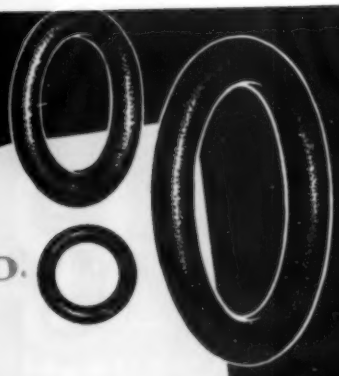

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Incoming inspections	.0020	Incoming inspections	.0020
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Replacement of defective O-rings in the field	.0160	Replacement of defective O-rings in the field	.0000***
Total Unit Cost	$.0452	Total Unit Cost	$.0250
Total Cost for 50,000 Units	$2,250.00	Total cost for 50,000 units	$1,250.00
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VOLUME 8 NUMBER 3

MARCH 1955

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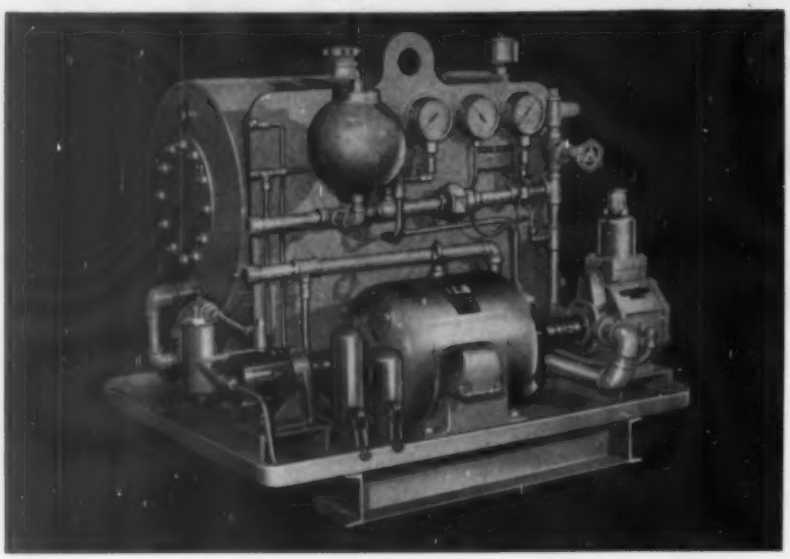

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HYDRAULICS FOR MOBILE EQUIPMENT
VOL. 2

Mobile Equipment News

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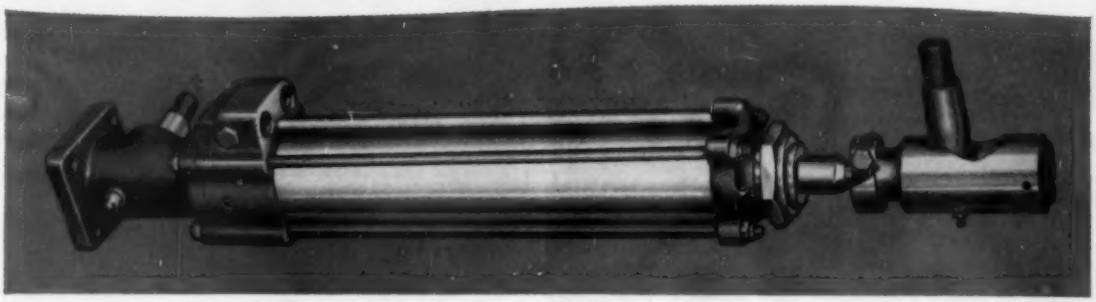
NO. 3

New! VICKERS® HYDRAULIC POWER STEERING BOOSTER...SERIES S23



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More compact . . . improved in operating characteristics . . . this new Vickers Steering Booster, Series S23 is an important new development in power steering for many vehicles. Application is much easier because it requires less space . . . and ultimate costs are substantially lower. Series S23 thus opens the way to fingertip ease of steering for a wide range of additional vehicles.

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Series S23 Boosters are provided either with (Model S23R) or without (Model S23N) an integral relief valve. Model S23N is used with Vickers VT16 and VT17 pumps that have integral volume control and relief valve. When the larger volume Series V200 pump is used and a volume control is required in the circuit, the S23N is used with a separate combination valve (see Series FM2 below). Model S23R is used with the Series V200 pumps that have no integral valving, for applications where a volume control is not required.

ASK FOR NEW BULLETIN M5106

MORE VERSATILE INSTALLATION

In Series S23 Boosters, the servo ball stud housing is symmetrical, and can be assembled in any one of four positions. This and the compactness of the Booster makes application easier . . . increases the number of applications which can be made without major engineering changes. Series S23 Boosters can be mounted interchangeably with Models S6-277 and S6-279 Boosters.

REQUIRES LESS SPACE

The new booster has been reduced in size by the redesign of the servo control valve. The tube connecting the servo valve to the rod end has been relocated and is now on the same side as the fitting connection. As a result of these changes, Series S23 requires less space . . . works in closer quarters.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

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Fluid Power Lines

about Applied Hydraulics

Contour Cutting

Rockford Machine Tool Co. has been one of the pioneers in applying hydraulic power to shapers and slotters. One of their most recent developments in contour cutting is described in this month's lead article by Earle Johnson and Stanley Bjorklund.

If you are planning to enter the 1955 APPLIED HYDRAULICS Prize Paper Contest, you'll be interested in knowing that this article was awarded one of the prizes in last year's contest.

Almost every machine tool builder has development engineers busy on projects involving oil powered tracer systems. Today, it is possible to adapt most shapers, slotters, milling machines and lathes to tracer control. Problems of accuracy, simplicity, ease of operation and reliability still persist.

These problems are not only being solved by the design of new systems. A large part of the success of these circuits is resulting from proper care and understanding of hydraulic equipment by the user.

New Use for Hydraulics

One of the truly new uses of oil power is on an overhead traveling shop crane. This crane uses a fluid motor drive to power the bridge. The circuit is so simple and efficient that one wonders why this drive has not been widely used on cranes. Its good performance is really a measure of the development of good tube fittings and tubing techniques which eliminate any leakage which could have spelled failure to this application. The possibility of dripping oil from a crane moving overhead at the rate of 300 fpm has been the biggest obstacle to the use of hydraulic power on these machines.

Ideas from a Sales Engineer

Starting this month, you'll find a new regular feature in APPLIED HYDRAULICS. It's a column written by Elmer Heiser who has sold air and hydraulic components in northern Ohio for more than 18 years. We think you'll find valuable this opportunity to borrow from Elmer's experiences which he treats amusingly in both words and cartoon. This month, on page 118, he makes the salesman both a bum and an expert—take your pick.

Cut Your Drawing Costs

We've found a new way to prepare JIC hydraulic and pneumatic circuits which greatly reduces our drawing time. What's more it takes most of the repetitious drudgery out of drawing the same symbol many times. You can use this new method too. We've described it in a short article on page 65. The savings in time and patience is the result of a new kit. If you want to learn where you can get this kit send us a postcard.

Impact Problems

These problems can be difficult. The success of an entire machine often depends on control of impact forces. James Melead includes in his article the basic calculations for determining the impact forces caused by the air powered knife on a sheet plastic winder. His drawings show you how these forces are easily controlled with a very simple closed oil circuit.

Controlled Acceleration

Control of cylinder speed as motion is started or stopped presents a difficult problem on some machines. Cushions and deceleration valves provide an adequate solution in most cases. On operations where acceleration and deceleration is critical, control of a deceleration valve requires special consideration. One solution to this control problem is described by Don Kingston, Sylvania Electric, in his article, "Acceleration Control." His valve and its control can be adapted to regulate motion of most oil powered cylinders.

Problem Clinic

This month under the heading of Problem Clinic, Henry F. Gray tells how noise in a hydraulic system was traced and eliminated. It's an interesting problem which required the talents of an engineer who is also a Sherlock Holmes. If you have done a job which would fit into our Problem Clinic, why not write us about it?

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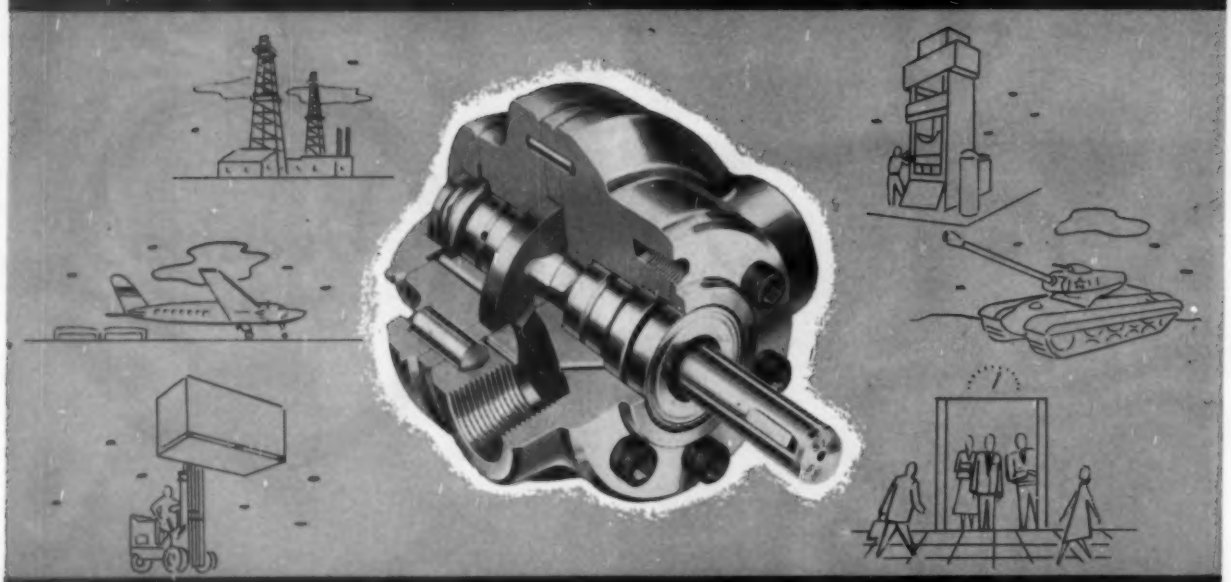

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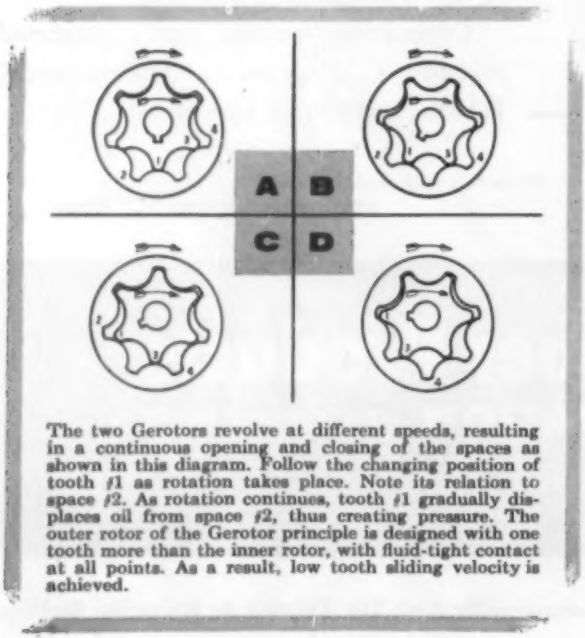
Gerotor's simple design and sturdy construction assures longer, trouble-free life for your hydraulic system!



The two Gerotors revolve at different speeds, resulting in a continuous opening and closing of the spaces as shown in this diagram. Follow the changing position of tooth #1 as rotation takes place. Note its relation to space #2. As rotation continues, tooth #1 gradually displaces oil from space #2, thus creating pressure. The outer rotor of the Gerotor principle is designed with one tooth more than the inner rotor, with fluid-tight contact at all points. As a result, low tooth sliding velocity is achieved.

Friction is the basis for all wear . . . Gerotor's exclusive rotor design cuts friction to a minimum. The Gerotor principle . . . heart of every Gerotor pump . . . is represented by a pair of gear-shaped elements, one within the other. Power is applied through the shaft to the inner Gerotor and is transmitted in the closed mesh region to the outer Gerotor.

Each tooth of the inner Gerotor is in sliding contact with the outer Gerotor at all times, providing continuous fluid-tight engagement at very low contact speed. The contact points revolve only once in seven to nine revolutions, depending on the type of unit. ***This reduced friction permits higher shaft speeds, assures longer life.***

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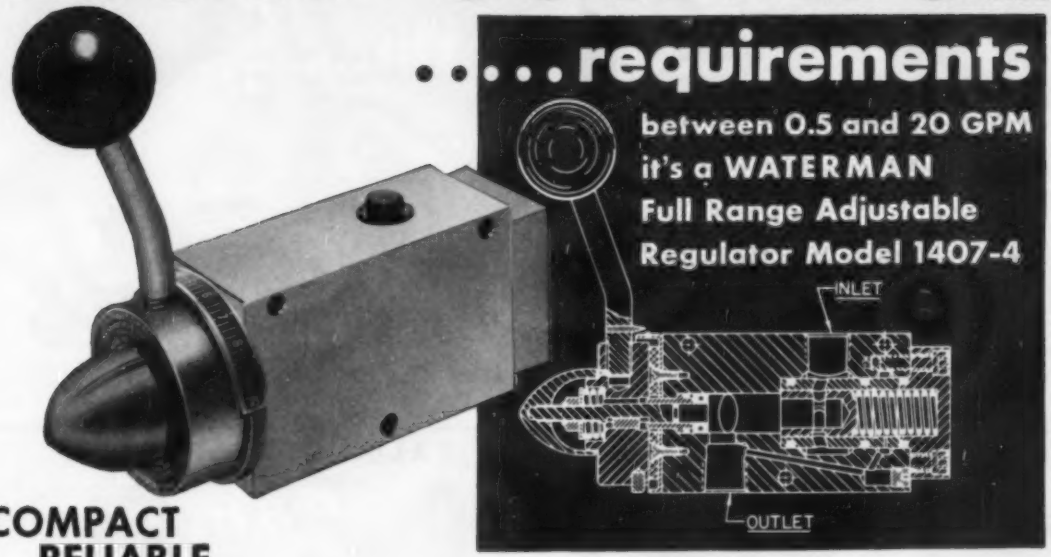

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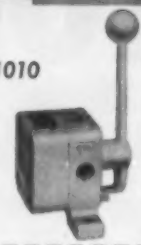
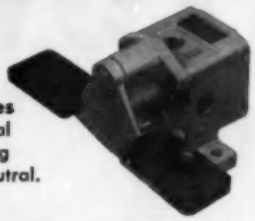
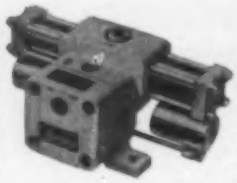


Hand Valves
Manual or spring return to neutral or to reverse.

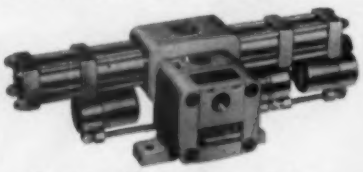
Foot Valves
Single pedal spring return to reverse.



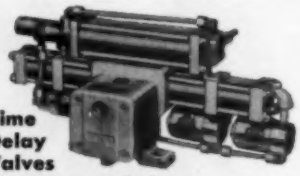
Foot Valves
Double pedal foot or spring return to neutral.



Power Valves
Two position, forward and reverse.



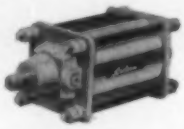
Power Valves Three position, forward, neutral and reverse.



Time Delay Valves
Power operated closing after delay interval.

CYLINDERS
bulletin 500

Heavy Duty Cylinders



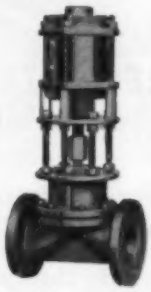
Medium Duty Cylinders

Boosters

Special Cylinders

VALVE ACTUATORS
bulletin 3030

Gate Valve Actuators



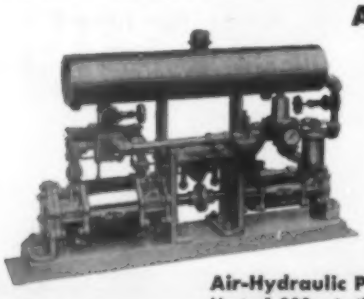
Diaphragm Valve Actuators

bulletin 3020

Plug Valve Actuators

Plug Valve Actuators

AIR HYDRAULIC PUMPS *bulletin 4000*



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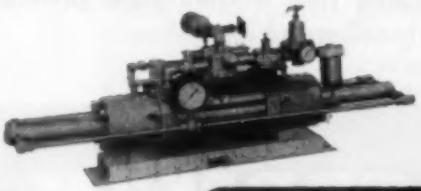
Up to 1,000 psi oil from 100 psi air or gas.



Air-Hydraulic Pumps
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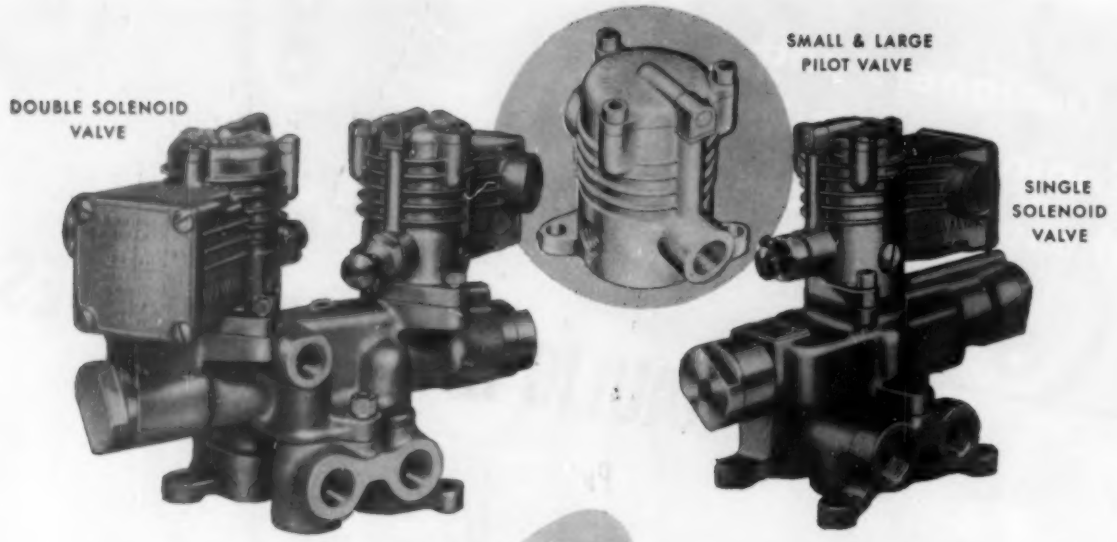
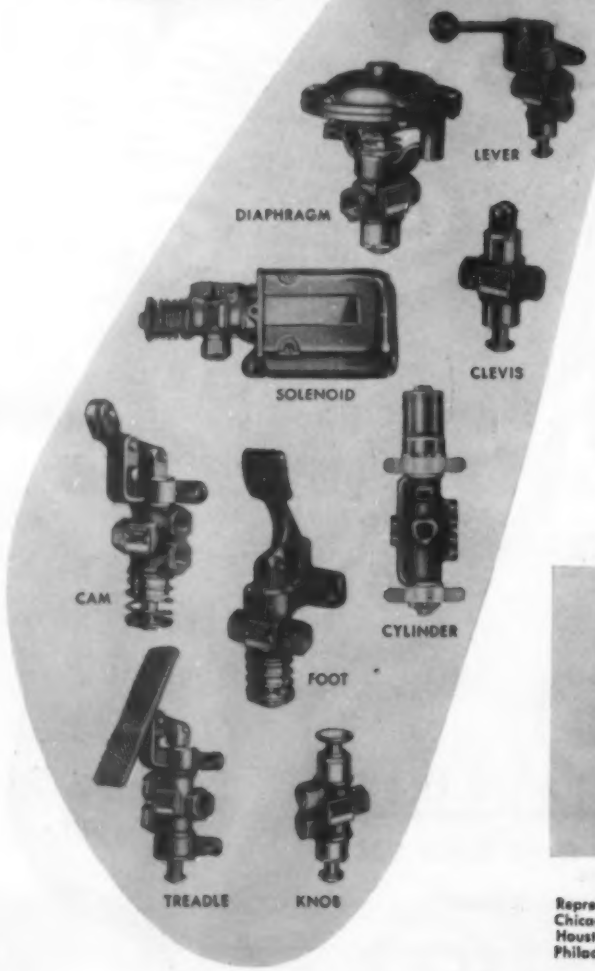


AIRMATION BY VALVAIR



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BRIEFS about fluid power

AIR-OIL DRILL UNITS SPEED BEARING PRODUCTION

Two automatic indexing air-hydraulic drill units, designed and engineered by Rollway Bearing Company, machine in one operation roller pockets for bronze retainers of precision radial and thrust roller bearings.

Previously they were machined on two converted gear chamfering machines and required two complete operations.

With the new drills, variable rates of speed are possible for particular jobs. Due to the equipment's rigidity, carbide tools now machine roller pockets to finish size in one operation. Supported by specially designed mounts, drill spindles keep drill heads moving smoothly throughout the feed cycle. Failure of any portion of the electrical control circuit results in the machine returning to the start position. This interlocked control circuit is a series of limit switches and relays coordinated with the machine's air-hydraulic drill units and air-mechanical indexing system.

Air for the drill units and for the indexing cylinder is supplied and maintained by an air compressor at an average of 90 psi. The self contained hydraulic system of each drill unit cushions the power provided pneumatically to produce rapid approach to the work, controlled speed and an equally rapid rate of return.

With an index cycle of two seconds, this new machine has increased output by 100 percent.

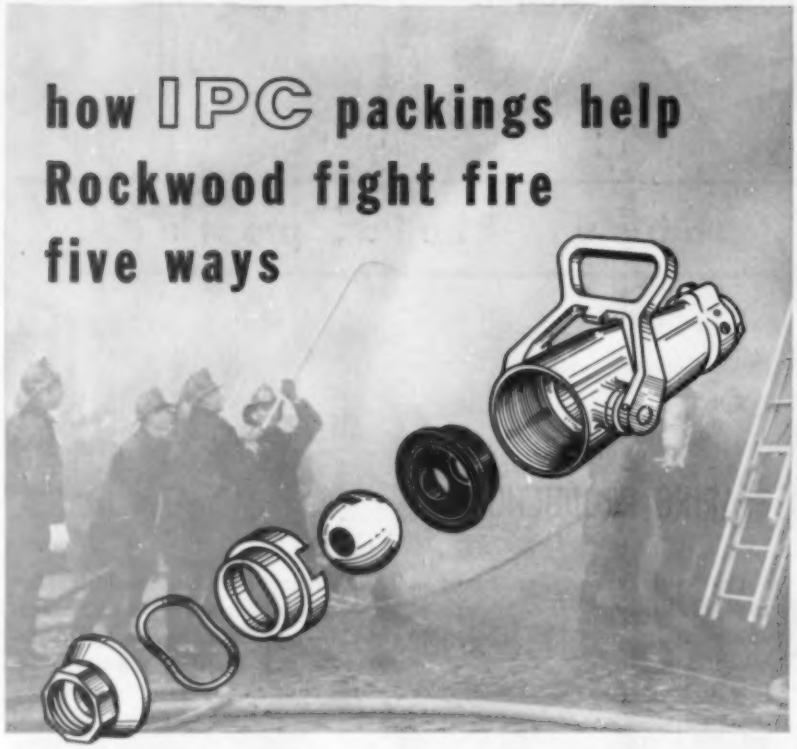
▼▼▼

Giant Compressor Station Tests Aircraft Equipment

One of the largest air facilities has been installed at Wyle Laboratories. Located at El Segundo, California, the facilities are available to the entire aircraft industry for economical development and qualification test work.

Continued on next page

how IPC packings help Rockwood fight fire five ways



In Rockwood Sprinkler's all-purpose nozzle, fire-fighters have a basic weapon for fighting fire with five different types of water action. From high-velocity water fog to solid foam streams, the floating ball in the nozzle body can be positioned to the desired action.

A special dual-aperture packing, developed by IPC, seats and seals the ball *instantly*. Another unique problem . . . solved by IPC's thorough analysis of requirements, and their careful selection of packings material.

Pneumatic or hydraulic problems are best solved by IPC packings, either standard or special types, in leather or synthetic rubber. An IPC engineer will help you determine the best material . . . the most effective design. Write today!

This IPC packing, used in the Rockwood nozzle, is made of Buna N rubber (90 Durometer) and can operate under pressures up to 300 psi.

IPC PACKINGS

IPC *serves industry with cup, flange, U and Vee packings, oil seals and custom packings.*

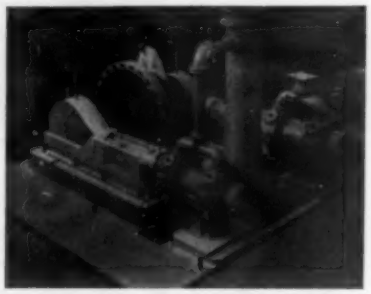
Cup Flange U Vee Oil Seals

INTERNATIONAL PACKINGS CORPORATION
A subsidiary of Graton & Knight Company
Bristol, New Hampshire

P1

BRIEFS continued

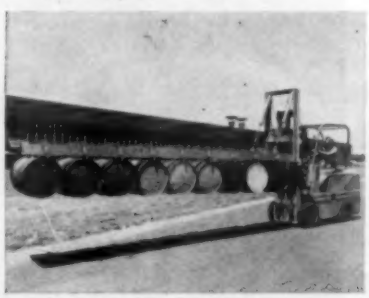
This new facility consists of a two-stage compressor driven by an 820 horsepower electric synchronous motor. The compressor has a continuous capacity air flow of 200 pounds per minute at a pressure of 250 psi. Entire output of this system



is heated in a natural gas-fired heat exchanger to temperatures of approximately 1000 degrees F. Flows of approximately 12 pounds per second can be achieved under transient conditions for cycling of valves, pressure regulators, turbines and other hot air driven airborne accessory equipment. ▼▼▼

Hydraulic Cylinders Lift Oil Drum Attachment

Handling of as many as nine empty drums at one time has been made possible by an attachment developed by the Yale Materials Handling Division of the Yale & Towne Manufacturing Company.



When picking up a load of empties, the hydraulically actuated clamps, interspersed on a 224 inch boom, grab all nine drums simultaneously. Drums are stacked in a

Continued on page 16

Jones & Laughlin *uses many*

Fuller Rotary Compressors

Like many other steel producers and fabricators, from the East to the West Coast, Jones & Laughlin Steel Corporation has purchased and uses many Fuller Rotaries in its various mills. Illustrated above is a Fuller Rotary Two-stage Compressor, having a capacity of 1660 c.f.m. 120-lb. pressure, installed in the P-1-10″ bar mill of the Pittsburgh Works Division.

Endurance, plus efficiency and maintained capacity, flow of air without pulsations, elimination of vibration, are results of the rotary principle employed in the design of the Fuller Compressor. They can be placed on comparatively light foundations, on balconies or upper floors to save valuable floor space and shorten distribution lines. Employing a minimum of moving parts—rotor, bearings, blades—greatly reduces maintenance and eliminates adjustments entirely.

The cylinders of a Fuller two-stage machine are at ground level, mounted on a common base plate, and are connected by a flexible coupling. Installation is very simple, the motor being lined up to the coupling on the shaft extending from the low-pressure cylinder. This arrangement simplifies motor maintenance work as compared with many other types of machines.

Due to extremely low inertia and WR^2, Fuller compressors, which operate in speed ranges of 600 to 1750 r.p.m., according to size, and are directly coupled to the motor, may be installed with either a general purpose or a normal torque synchronous motor, as dictated by size and the electrical requirements of the plant. Standard motors are available for all sizes of Fuller compressors in either squirrel cage or synchronous types.

For full information, write for Bulletin C-5A.

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PIONEERS OF HIGH-EFFICIENCY VANE-TYPE ROTARY COMPRESSORS

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R/M Vee-Flex — America's most copied packing—is *the* one packing for hydraulic applications that you can depend on without question. Even at pressures in excess of 6000 psi, it will give a perfect seal without extruding. Its tremendous ability to "take it" is due to its completely homogeneous construction — its unusually deep and thorough compound penetration. The design of R/M Vee-Flex makes it self-adjusting and self-sealing. Only finger-tight gland adjustment is required. And a fine seal is obtained even when the equipment is motionless. For complete data, including a table of sizes, write for a copy of the R/M Vee-Flex Bulletin.

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FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks Clutch Facings • Fan Belts • Radiator Hose • Bowling Balls

BRIEFS / continued

pyramid fashion. This is accomplished by two double acting cylinders which tilt the boom 65 degrees toward the vertical.

The drums can be carried either in horizontal or near vertical position at the operator's discretion.

▼▼▼

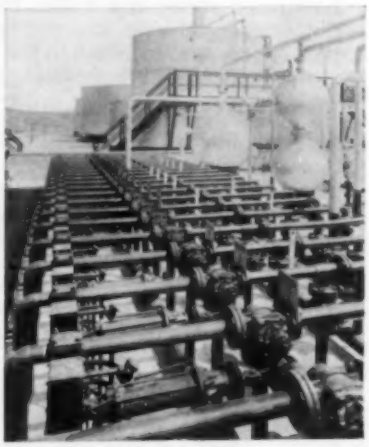
Pneumatic Working Display Promotes Use of Air

The Berklyn Co. has started an educational program showing the many increased production possibilities with air. Available to large and small industries in Southern California, the display provides actual working conditions and operations with simple and intricate hook-ups, includes many types of valves, cylinders and pneumatic devices designed for economical production.

▼▼▼

Oil Company Uses Automatic Trap Farm

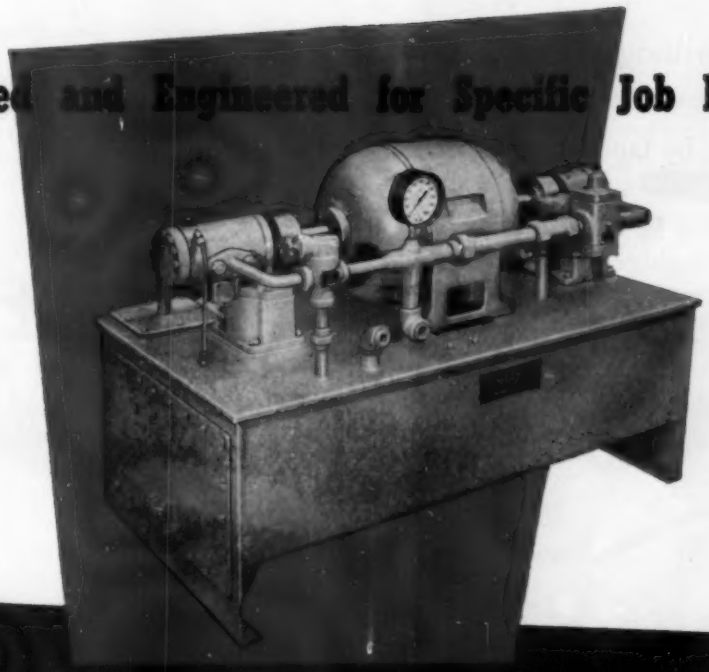
Prorating gas and oil production has become, with the aid of a battery of 20 plug valve actuators, a simple, routine push-button affair.



By means of a time clock, the solenoid valve in each actuator is energized when the individual well is to

Continued on page 20

Designed and Engineered for Specific Job Requirements



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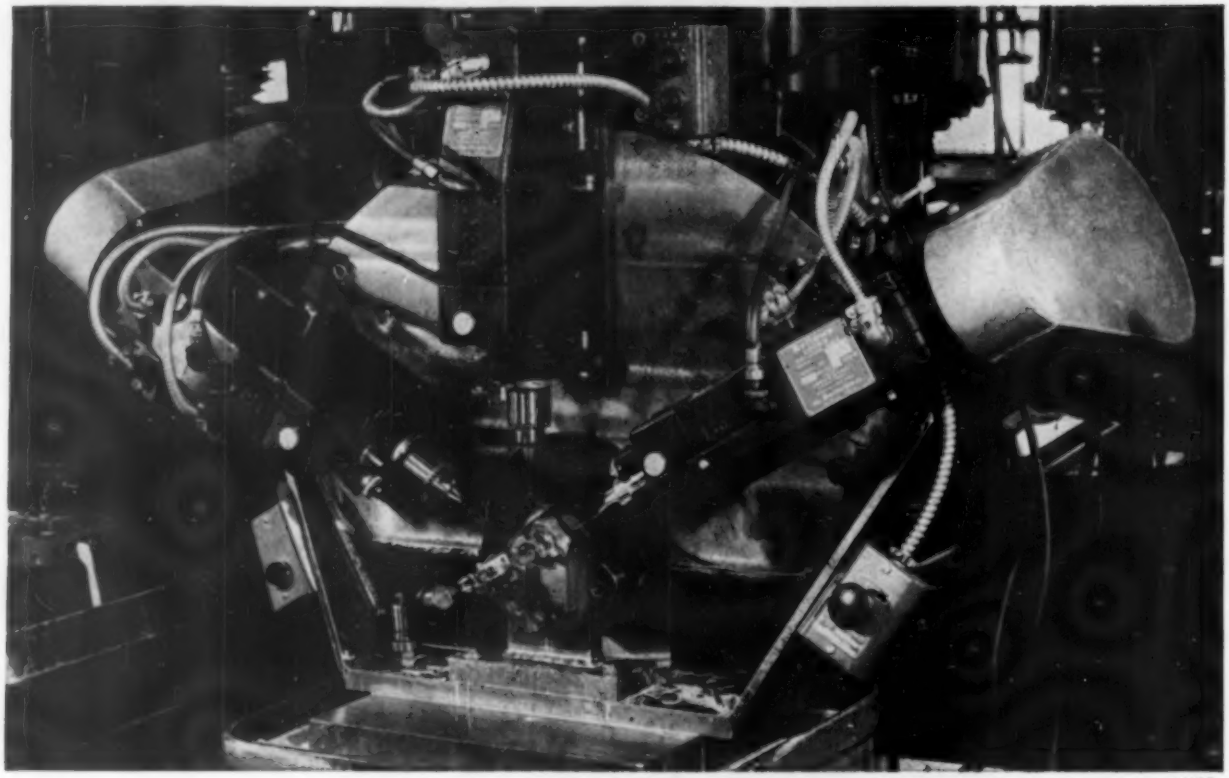
The Case of The Bellows Co.
VERSUS
The High Cost of Drilling Holes

Testimony taken by tape recording in the plant of [redacted], Detroit, Michigan

Operation: Drilling ¼" holes in hex head aircraft bolts on a tool-room-built machine, using three Bellows-Locke Drill Units



1102A

Statement of [redacted], General Superintendent

Q. How was this operation performed before you built this special machine?

A. We drilled on a single spindle by hand, with an index fixture to locate the three stations. However, it was difficult to hold a true position and the hole did not come through parallel from one end to another.

Q. Why wouldn't it come through parallel?

A. On account of feed and speed. The feed had to be controlled by hand.

Q. The old way, besides hand feeding, you would have to hand index the part?

A. Right. We had to index every time we drilled a hole.

Q. Can you give me a comparison of production rates on the old method and on this machine?

A. We increased almost 50%.

Q. What is the highest rate of production you get on this machine?

A. Somewhere around 240 pieces per hour.

Q. What other advantages have you found? You get a good deal less spoilage on finished parts, don't you?

A. Yes, considerably. We hardly get any spoilage at all now.

Q. On the old method, did you need to use a skilled operator?

A. Well, he had to know something about it in order to handle the drill carefully. When we're using a No. 60 drill, it does require a person that knows how to handle it.

Q. On this machine, you just use a girl operator, don't you?

A. That's all—the machine takes anybody as long as they can put a part in and press the button and take the part out.

Q. How long has this machine been in operation in your shop?

A. I can't tell exactly—about six months or more.

Q. Has it been working every day?

A. 9 hours a day, 5 days, sometimes 6 days, a week.

Q. Do you have other Bellows equipment in your plant here?

A. We have two infeeds on centerless grinders; we have all our milling machines operated by Bellows Air Motors; vises operated by Air motors; also on Dearborn fixtures which we index; as well as Air Motors on collets—it's all Bellows operated.

Q. Do you find this equipment adaptable for use on other machine tools?

A. Yes, we find it can be used on any machine.

Q. How long have you been using Bellows equipment here?

A. Ever since I remember—around 1945 or '46, during the last war.

Q. Do you have any of those old Bellows Air Motors around here now?

A. Yes, we have quite a few—a number of them were destroyed in 1948 when we had a fire, but after the fire we were able to overhaul them and put them back on the machines.

Q. You mean you put them in operation after they were damaged in the fire?

A. That's right.

Q. Are they still working?

A. Some of them are still working.

Q. They must be about 10 years old now?

A. Yes, they must be.

Statement of [redacted], Machine Operator

Q. [redacted], how long have you worked here?

A. Eight months.

Q. Did you do this operation on the old machine where you had to do it by hand?

A. Yes, sir.

Q. Could you tell me a little bit about that?

A. Well, it was not as easy to work as this new machine.

Q. Why was it hard to work on the old machine?

A. Well, you had to turn it every time you drilled and on the automatic, it turns by itself.

Q. And each time you turned it, did you have to pull the drill down?

A. Yes, we had to pull the drill down each time we drilled a hole.

Q. Did your shoulders get tired?

A. Oh, yes. It made your arms and shoulders awfully tired.

Q. Did you have to take any rest periods on the old machine?

A. Yes, because my arms would get so tired I couldn't keep on working.

Q. How often would you have to rest?

A. About twice during the morning.

Q. When you'd go out to lunch after working on this old machine—did your arms get stiff or anything like that?

A. Yes, at night—especially when I'd quit work, they'd get awful stiff.

Q. What did you do for it?

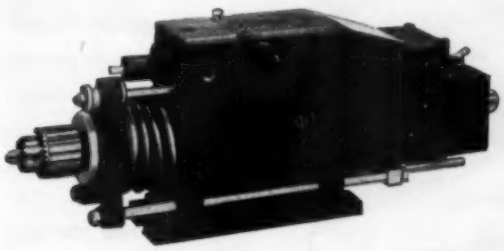
A. Rub them and bathe them and that's about all, I guess. Then do it again the next day.

Q. I imagine you like this new operation pretty well?

A. Oh, yes, I like this fine.

The electrically driven spindle is fed by air power up to the work at which point hydraulic feed control takes over. Built-in speed controls permit regulation of rapid traverse. Drill depth adjustable up to 3". Drilling capacity up to ⅜" in mild steel. All controls are built-in. Valving is electrically actuated. Depth accuracy .005" (with optional electric depth control .001"). Optional deep hole drilling controls. Available in three types: pulley driven, in-line direct motor drive, or parallel mount motor drive. Also available with reversing motor for direct tapping operations.

This Is the Drill Unit That Increased Hole Drilling Production Almost 50%



WRITE FOR THIS BOOKLET

Describes the Bellows-Locke Drill Unit in detail—shows how and where it can be used to best advantage. Free on request. Address: The Bellows Co., Dept. AH355 Akron 9, Ohio.

1102A

The Bellows Co.
AKRON, OHIO

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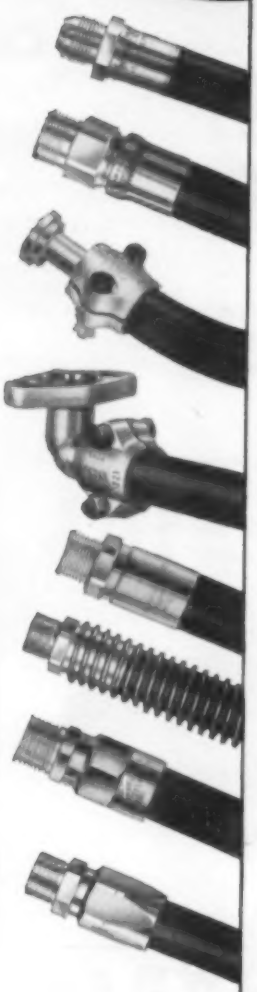

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Write for our catalog describing all standard Anchor Assemblies.

ANCHOR COUPLING CO. INC.

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Dallas, Tex. Plymouth, Mich.

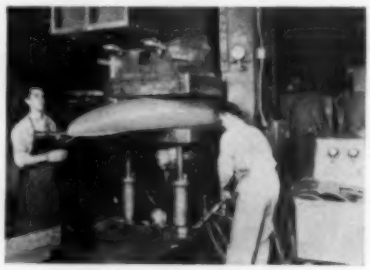
BRIEFS / continued

go on test. Air pressure in the cylinder then turns the 3-way plug valve. The output of the individual well is diverted from the bulk header into the test header and then through automatic metering and recording equipment.

According to estimates by installation engineers the annual savings in manpower promise to be of major proportions.

▼▼▼

Forging Press Converted to Do Deep Draw



A part is removed after first stage forming from the draw die of this hydraulic forging press. As part of a continuing program to increase machine utilization, Pastushin Aviation Corp. engineers reworked this hydraulic press to deep draw sheet metal. The portable hydraulic cart at right supplies power to hydraulic cushions.

▼▼▼

It's Dangerous Thinking

. . . to believe that increased use of automatic machines will prove harmful to labor, says Dr. Haldon A. Leedy, director of Armour Research Foundation of Illinois Institute of Technology.

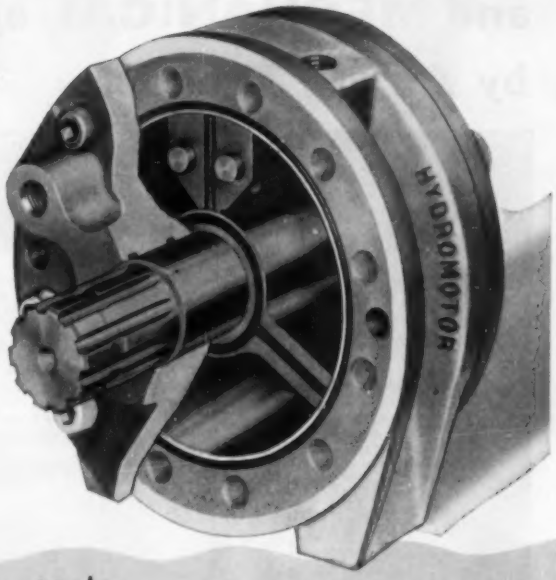
Referring to recent statements, he denied, that growth of automatic machines would create millions of jobless, and said the value of automatic machines far outweighed any disadvantages. Dr. Leedy in predicting that the nation's standard of living in 1975 would be double that of 1950, if present rate of increase continued, gave as one of the principal

Continued on page 22

BONNOT *Hydromotor*

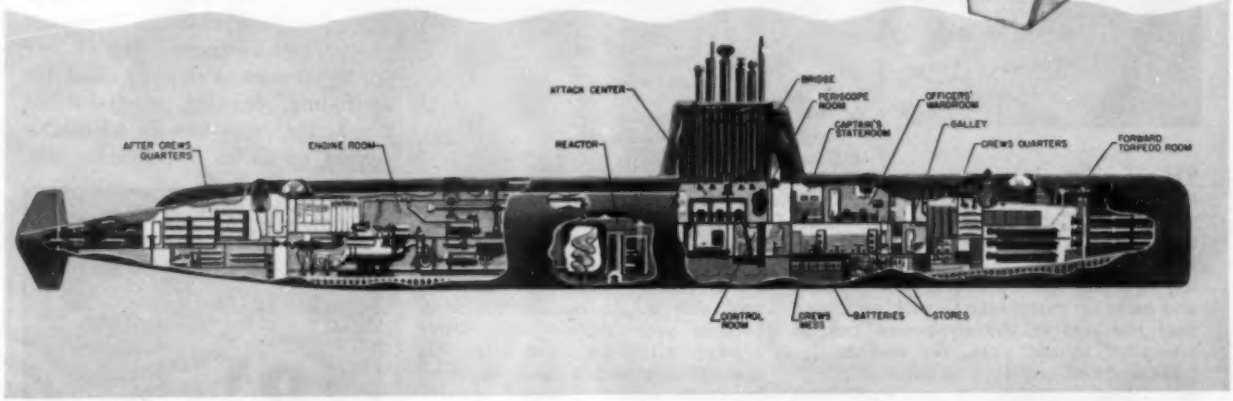
GOES TO THE NATION'S DEFENSE

aboard the *Nautilus*



Aboard the Navy's first atomic-powered submarine Nautilus, the space-saving, weight-saving Bonnot **Hydromotor** is efficiently providing RECIPROCATING ROTARY POWER. And in industry, these unique hydraulic actuators are replacing out-moded methods of "precision control, manipulation and movement."

In brief, the versatile Bonnot **Hydromotor** develops instant, full torque in either direction—operates with oil, water or air—may be installed anywhere, at any angle—is completely sealed and self-contained—may be stopped and reversed at any point.



Simple controls permit an infinite and variable range of speeds at any stroke length up to an arc of 280 degrees. Standard models develop 150 to 300,000 inch-pounds torque. Double vane units (same size) produce double torque—up to 600,000 inch-pounds—through 100 degree travel limit.

Larger and smaller sizes constantly under development or already custom-built.

Let us show YOU how Bonnot Hydromotors can help increase YOUR product efficiency or lower plant operating costs. Write for Bulletin 521 describing applications and engineering details . . . OR SUBMIT DETAILS OF YOUR SPECIFIC NEEDS.

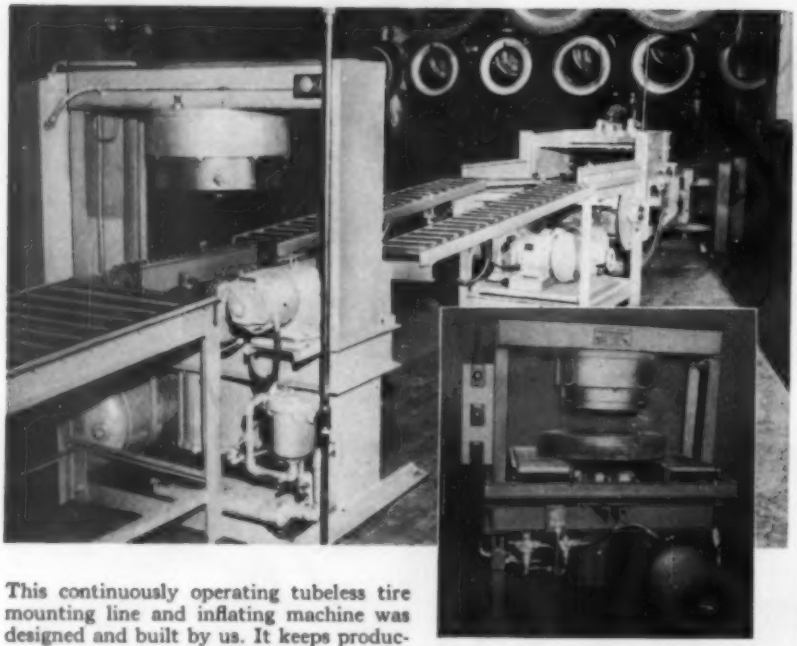
For Lowering • Revolving • Lifting • Pushing
Pulling • Swinging • Opening • Closing • Clamping
Turning • Indexing • Oscillating, etc.

Hydromotor DIVISION

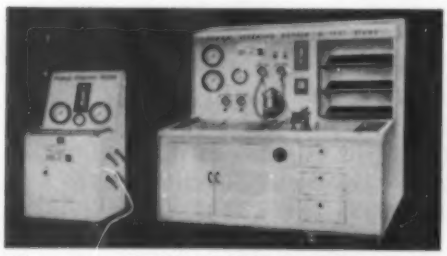
THE BONNOT COMPANY • CANTON 2, OHIO

Special

HYDRAULIC, PNEUMATIC *and* MECHANICAL *applications by Airway Products*



This continuously operating tubeless tire mounting line and inflating machine was designed and built by us. It keeps production lines moving at rates up to 30 ft. per min. This example of engineering and building ingenuity opens production bottlenecks and saves on manpower to such an extent that the cost of the equipment can be amortized in one year. We also design, build and test any type of automatic high production hydraulic or pneumatic test stands with capacities up to 25,000 P.S.I. You will find it pleasant and profitable to do business with us because your project will receive prompt attention from a flexible management and a keen engineering staff.



Get the complete story of Airway Products' services and products in this illustrated folder. It's FREE.

These two AIRWAY POW-R-STEERING TESTERS are the only efficient methods for testing power steering pumps for delivery characteristics and valve assemblies for leaks. The mobile model (left) tests pumps while they are in automobiles. The stationary model (right) has the same testing features plus work table and fixtures for complete repair work on power steering gears and pumps.

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AIRWAY FOR HYDRAULIC, PNEUMATIC and MECHANICAL AUTOMATION

BRIEFS / continued

reasons the increased research expenditures. Approximately $4 billion, or about 1 percent of the national income, is being spent on research and development.

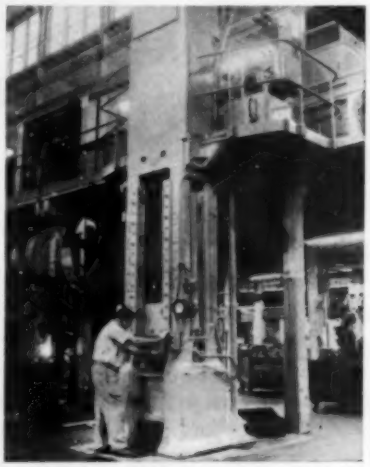
▼▼▼

Low-Friction Treatment For Rubber Parts

A low friction treatment for application to O-rings and other parts made of natural, synthetic and silicone rubbers, has been developed by Goshen Rubber Co., Inc. Extension of the life of parts where minimum wear is important is claimed on the basis of laboratory tests and actual application. The treatment, known as Gorlube, is given either by impregnation or coating, depending on the function and the part. ▼▼▼

Long Stroke Press

This 75 ton single action type press has been added to Worcester Press Steel Company's line of long stroke presses. Primarily used for extruding, drawing or reducing work, the press has an adjustable stroke up to 60 inches maximum.



The bed area is 20 x 21 inches, two variable delivery pumps are driven by a 150 hp motor. Pumps are controlled to provide rapid advance and return speeds with slow pressing speed. For ease of service the power package is mounted on a balcony accessible from overhead catwalk. ▼▼▼

Continued on page 26

THERE'S ONLY ONE OIL "just as good"

When you're offered substitutes for Gargoyle D.T.E. Oils, remember these facts—

We're mighty proud that, so many times, you're told some other oil is "just as good as Gargoyle D.T.E." This is high praise—additional proof that Gargoyle D.T.E. hydraulic oils set the *standard of performance* in their field!

Gargoyle D.T.E. oils are uniformly high in quality—have been continuously improved for over 60 years to meet advanced machine designs. Premium products, their initial cost is only slightly higher than ordinary oils—often only about *one mill per hour* of machine operation!

Actually, Gargoyle D.T.E. hydraulic oil is more economical in the long run because... 1) it lasts longer—has stayed in service for thousands of hours in many cases... 2) increases machine efficiency... 3) improves production... 4) reduces manufacturing costs.

Remember, too, you get the world's greatest lubrication engineering service—*at no extra cost*—when you insist on Gargoyle D.T.E. oil. Why accept less? Call us today!

SOCONY-VACUUM

SOCONY-VACUUM *Correct Lubrication*

FIRST STEP IN CUTTING COSTS

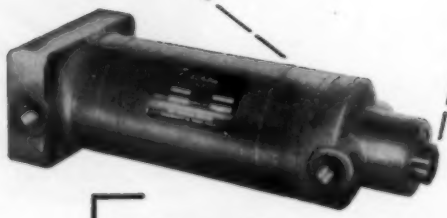
SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

Pathon

HYDRAULIC CYLINDER

RH Series 2000 P. S. I.

heads are retained by a single screw thread for maximum strength



You get

- Low stress concentration
- Greater resistance to fatigue and shock loading
- Rotatable pipe ports and mounting pads
- Compactness and Alignment Accuracy difficult to obtain in any other type of construction

In choosing Hydraulic Cylinders what are you looking for? *Compactness? Adaptability? Greater efficiency in operation?* You're sure of all three when you specify Pathon Series RH 2000 P.S.I. and Series QH 1000 P.S.I. Hydraulic Cylinders.
Write us today for our catalog. Let us show you why Pathon is rapidly becoming the leader in its field.

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HYDRAULIC DIRECTIONAL CONTROL VALVES

DO A BETTER JOB FOR YOU

Pathon MANUFACTURING CO.

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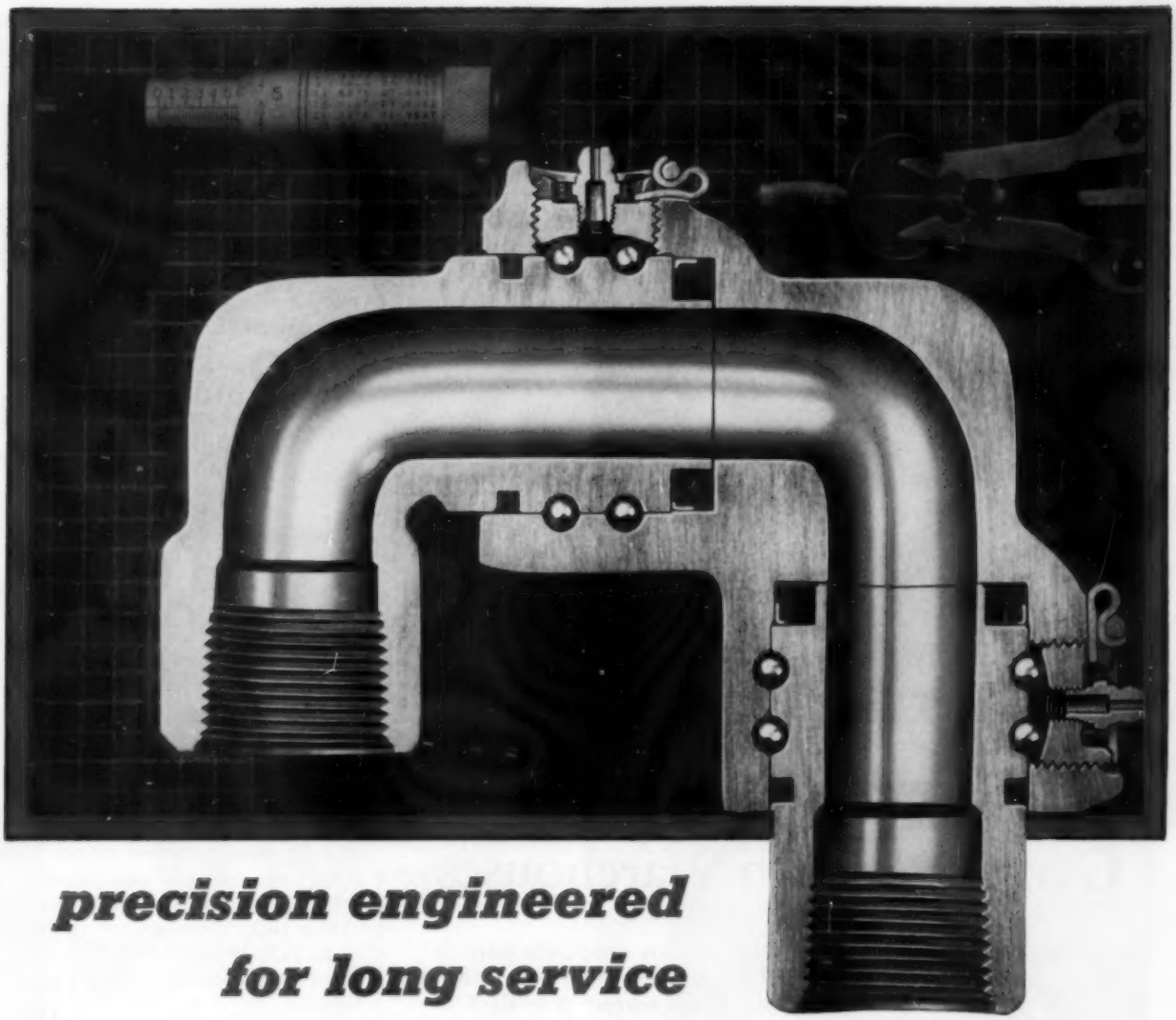


precision engineered for long service

CHIKSAN Ball-Bearing Swivel Joints are precision engineered like a fine watch to give unlimited flexibility and unlimited service in the conduct of fluids, gases and liquids.

CHIKSAN is the originator and largest exclusive manufacturer of ball-bearing swivel joints in the world today.

CHIKSAN produces packing designs for specific service requirements, assuring constant torque at any given pressure.

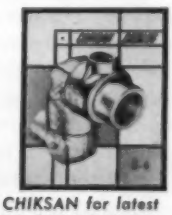
CHIKSAN has acquired a world-wide recognition for highest quality of product and lowest maintenance costs.

CHIKSAN has over a quarter of a century of "know-how" in the design, manufacture and successful scientific application of ball-bearing swivel joints in industry.

CHIKSAN offers the widest range of styles, sizes and pressures available for every major industrial use today.

CHIKSAN has complete nation-wide coverage of its products and applications by qualified field service engineers.

CHIKSAN will custom engineer for you the solution to any problems involving the transport of fluids, gases and liquids.



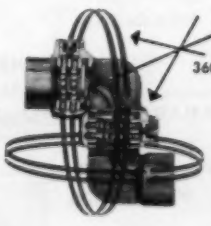
Write CHIKSAN for latest INDUSTRIAL CATALOG—G-4
Dept. AH-3

Supply and Service of CHIKSAN Ball-Bearing Swivel Joints is always as near as your telephone.

The Flow of Enterprise Relies on

CHIKSAN

Ball-Bearing Swivel Joints



CHIKSAN Ball Bearing Swivel Joints are THE NEW TOOL of Modern Industry with full 360° rotation in 1, 2, and 3 planes. Over 1,000 different types, styles, and sizes have been developed for pressures and services from 28" vacuum to 15,000 psi and for temperature ranges from minus 70° to o plus 500° F. with packing materials for each specific service.

CHIKSAN COMPANY • BREA, CALIFORNIA • Chicago 3, Illinois • Newark 2, New Jersey

Weir Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co., Brea, Calif.; Newark 2, N. J. • Chiksan of Canada Ltd., Edmonton, Alta.

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Yes, now you can obtain Garlock O-Rings direct from our branch warehouse nearest you. Each of our warehouses stocks 70 durometer rubber O-Rings in all popular standard sizes. For you this reduces delivery time to a minimum.

You can rely on Garlock O-Rings, too. They're made to Garlock's rigid quality standards. This means O-Rings with precise tolerances, a flash-free finish, and utmost uniformity.

For complete information, just contact your Garlock office or write for new O-Ring folder AD-148.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK

In Canada: The Garlock Packing Company of Canada Ltd., Toronto, Ont.

GARLOCK

BRIEFS continued

Aircraft Jack Fabricated By Inert-Arc Welding

Hydraulic aircraft jack, with a lifting capacity of 30 tons, and a maximum extended height of 16 feet 8 inches, is, except for the caster wheels, 100 per cent inert-

arc welded. A hand-operated hydraulic pump, attached to one of the three legs, provides pressure of 2,750 psi to the lifting head. These jacks manufactured by Regent Jack Manufacturing Co., are used in the assembly of large cargo planes. ▼▼▼

New Hydraulics Text Book

A valuable contribution to hydraulic literature has been made with Ian McNeil's volume "Hydraulic Operation and Control of Machines" published by Thames and Hudson, London, England.

Covering the employment of hydraulics as a means of transmitting power and of controlling mechanical motion, the book contains 17 chapters, ranging from an introduction and historical survey to the operation, care and maintenance of hydraulic plant and equipment. The basic theoretical considerations of hydraulics are well described and simply illu-

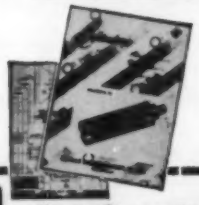
Continued on page 28

Quality | performance you can count on

O-M (air • hydraulic) CYLINDERS

Designed and engineered to last... to give prolonged service with minimum maintenance. Husky, smooth functioning O-M cylinders are constructed of steel, with precision-machined bronze bearing surfaces. *Special Interlocking Mechanism* eliminates bulky tie-rods, end caps—saves ⅓ installation space. This feature also assures perfect alignment, lower coefficient of friction. Easily removed, inspected, repaired. Every unit power-tested to rigid standards.

Standard, semi-standard, "special" air and hydraulic cylinders available in full range of sizes (1½" to 8" bores) with standard, 2 to 1 or oversize rods. Completely interchangeable parts. Immediate delivery on many sizes.



fits where others won't!

mail coupon now!

for FREE catalog, complete set of ½-scale templates, showing all cylinders, mounts and mounting brackets.

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☐ Have representative call ☐ Send latest catalog ☐ Send ½-scale templates

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New... FreeFlow GASKETS

JOHN CRANE

made of TEFLON*

"JOHN CRANE" FreeFlow Construction
Gasket flush with pipe I.D.—allows completely unrestricted flow.
No air pocket—insert flush with I.D. of envelope. No danger of rupture due to expansion of entrapped air, at high temperatures.
AIR
Ordinary "Wishbone" Construction
Envelope extends beyond I. D. of pipe, causing flow restriction and turbulence.
Expansion of entrapped air at high temperatures presents danger of gasket rupture.

FOR EVERY CORROSIVE SERVICE

"John Crane's" FreeFlow construction and chemically inert Teflon have been combined as *the* answer for gaskets in hydraulic service. This new construction assures a flush fitting with the I.D. of the pipe and the inner wall of the Teflon envelope, not possible with the ordinary "wishbone" type gasket. (See drawing above).

This means elimination of:

1. Flow restriction and turbulence in the line.
2. Danger of rupture at high temperature due to entrapped air between gasket insert and Teflon envelope.

"John Crane" Teflon FreeFlow gaskets can be used in the transmission of all hydraulic or lubricating fluids, including the newly developed synthetics. They are unaffected by extreme temperatures from −100° to +482°F., depending on the insert material. Available in all shapes and sizes for a wide variety of service requirements.

Request full information on "John Crane" FreeFlow gaskets for your particular requirement. Ask for our informative booklet, *The Best in Teflon*, for other important technical and application data. Crane Packing Company, 1805 Cuyler Avenue, Chicago 13, Illinois. *In Canada: Crane Packing Co., Ltd., 617 Parkdale Ave., N., Hamilton, Ont.*

DEPEND ON "JOHN CRANE" TEFLON PRODUCTS

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JOHN CRANE CRANE PACKING COMPANY 38 YEARS INDUSTRIAL PROGRESS

BRIEFS continued

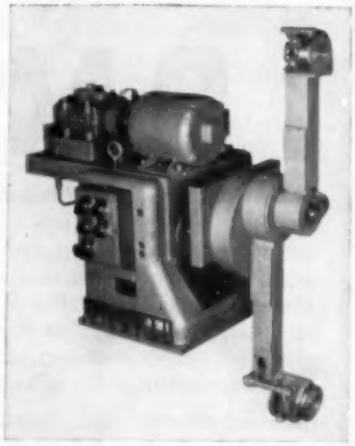
strated, as are the chapters on hydraulic components, hydraulic fluids and hydraulic machines. Stress has been laid on present day developments and future trends.

This 324 page volume includes many photographs and drawings, an index and a useful select bibliography. Approximate American price is $5.50. ▼▼▼

Automatic Loader Uses Pneumatic Clamps

An automatic loader and unloader adaptable to use with horizontal spindle machines such as lathes and grinders has been developed by Hautau Engineering Company.

Loader has two arms which swing through 180 degree arcs about a central axis and carry work



clamps on their outer ends. While one arm is unloading a finished part from the machine, the other arm picks up new part from incoming conveyor.

The work clamps are opened and closed through action of pneumatic cylinders located in the arms. The cams are powered by an electric motor which acts through a speed reducer and an electrically actuated clutch and brake set. The movement of the arms and the turning and lifting of the central hub are obtained by a cam actuated mechanism which moves on preloaded ball bearing slides. ▼▼▼

Continued on page 30

on your Hydraulic Tubing problems

Need special service on a hydraulic tubing problem? Or special sizes and shapes made to your specifications? Then we're the people to see.

We're geared for service. Our research, production and sales teams are small enough to give you the kind of personalized service and teamwork that gets results when nothing else can. And they're big enough to achieve volume production in a hurry at our modern, versatile plant.

Whatever the type of cold drawn, seamless tubing you require, you'll find that Summerill is completely equipped to produce it to *your* specifications. What's more, every operation at Summerill is laboratory controlled to give you consistent peak quality of product with every tube.

Why not let us get started on your problem today? We'll welcome the opportunity to serve you and show you how you can make a better product at less cost with Summerill Seamless Tubing. Address: Summerill Tubing Div., Columbia Steel & Shafting Co., Pittsburgh 30, Pa.

Summerill

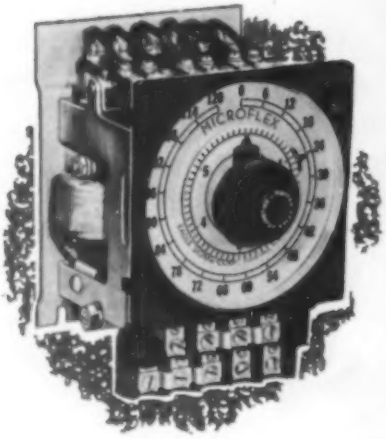
HYDRAULIC TUBING • SPECIAL TUBING • MECHANICAL TUBING • DIESEL TUBING • PRESSURE TUBING • AIRCRAFT TUBING

EAGLE MICROFLEX TIMERS

SECONDS

MINUTES

OFFER MORE FLEXIBLE CONTROL



Are your machines adaptable to different jobs — some requiring seconds — others requiring minutes?

The Microflex Timer with its micrometer accuracy and large, easy to read, wide range dial, makes this variation easily and quickly adjustable.

The Microflex is designed for outstanding ruggedness and dependability. Take advantage of the outstanding features of this timer for your processing machines.

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Industrial Timers by EAGLE

EAGLE SIGNAL CORPORATION
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BRIEFS continued

Aircraft Steering Design Uses Hydraulic Cylinders

A simple steering unit, doing the work of two conventional mechanisms, has been developed by Bendix Aviation Corporation.

Hydraulic cylinders replace the upper scissor member of usual torque links, serving both as torque

links and steering actuators. Also shimmy dampening is more effective because dampening forces are applied at a point where there is the least amount of spring action in the system. Control of steering motions while taking off, landing or taxiing is provided by a valve, operated by the pilot.

This compact unit, performing the dual functions, obtains savings in weight, space and maintenance.

▼▼▼

Annual NFPA Meeting to be Held in Colorado

The National Fluid Power Association's Second Annual (Spring) Meeting will be held at The Broadmoor Hotel, Colorado Springs, Colorado, on April 4, 5 and 6.

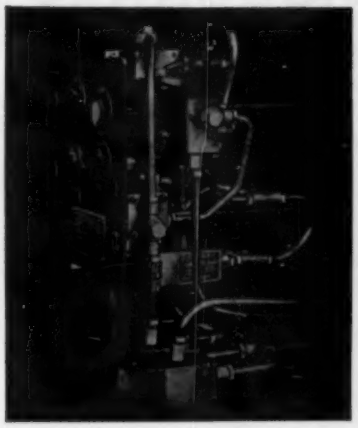
Theme of the meeting will be "Markets and Marketing". Most of the general meetings will be devoted to various phases of this subject, which is particularly timely due to the rapid extension of fluid power systems into new fields and applications.

▼▼▼

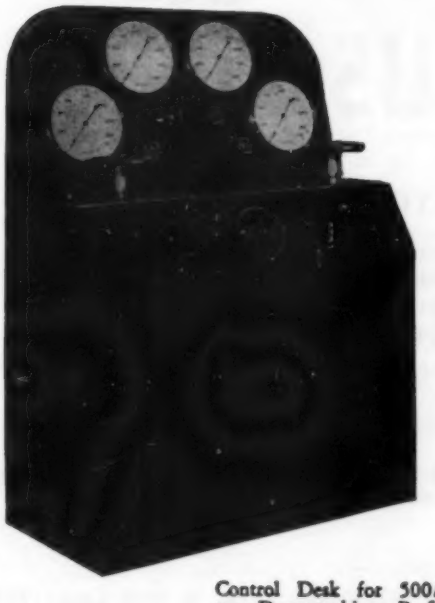
"Fingertip-control" OF HYDRAULIC PRESSURE

WITHOUT SOLENOIDS OR OTHER ELECTRICAL GADGETS

Packaged Unit comprising 22 h.p. motor mounting two Axial Plunger pumps, supply tank and control panel, operating pre-stressed concrete machine.



Fully hydraulic push-button control panel for a 100 ton Cartridge Case Drawing Press.



Control Desk for 500/500 ton Downstroking, Prefilling Press.

Any desired pressure is "at your fingertips" when operating the Autodraulic Control System —and without solenoids! Already giving consistent and unfailing performance throughout N. America in a wide variety of applications, the Autodraulic Control System cannot fail to give increased performance and greater economy in *your* plant.

AUTODRAULIC CONTROL SYSTEMS

WITH HYDRAULIC PUSH BUTTONS

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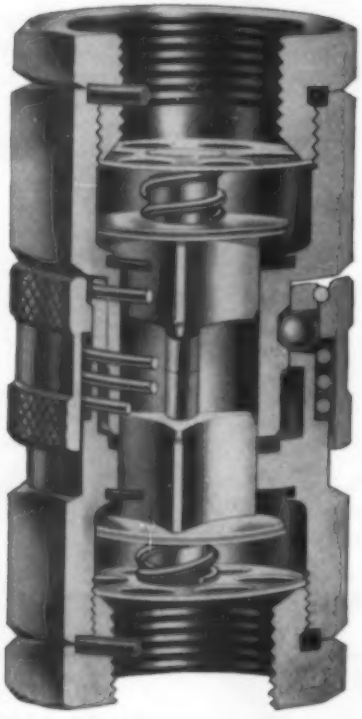
DISCONNECTED IN 1 SECOND

and NO DANGEROUS SPRAY



INSTALL SNAP-TITE "H" COUPLINGS:

- Snap-Tite "H" Series couplings are constructed so that the valve is completely closed in coupler before disengaging the nipple seal, eliminating fluid spray, and the only loss of fluid is the few drops in the nipple cavity.
- Powerful springs keep valves shut tight when "H" couplings are disconnected.

Check your couplings. Are they creating accident hazards and losing costly fluids? Are offensive odors and flammable gases escaping from them?

SNAP-TITE'S "H" COUPLING, SIZE FOR SIZE, IS THE SMALLEST COUPLING WITH HIGHEST STRENGTH AND HIGHER EFFICIENCY

Recessed valve washers . . . fluted valve stems . . . valve stops with minimum flow restrictions . . . large inside diameter—these combine to allow maximum flow capacity with lowest pressure drop.

Available in sizes ⅛" to 10" in alloy steel or to specifications

SNAP-TITE COUPLINGS CAN HANDLE ALMOST ANYTHING THAT FLOWS

See the Snap-Tite representative in your city or write for Bulletin 240A

Snap-Tite, INC.
UNION CITY, PENNSYLVANIA

Useful Literature

For your free copy of publications reviewed, fill in the reader service card

VALVE SUBPLATES . . . for gasket mounted hydraulic valves which have fluid ports in one face of the valve body are described in a four page bulletin. Gasket mounting on this type of subplate permits valves to be removed and replaced without disturbing piping connections, allows concealment of piping, eliminates pipe taps in valve bodies. Construction features and design details are illustrated. This bulletin, about the Hupp-Lapeer threadless subplates, is available from Petch Mfg. Co.

Fill in No. 165 on Reader Service Card

FIRE-RESISTANT FLUID . . . A 20 page booklet, offered by Monsanto Chemical Company, covers Pydraul F-9. It includes a step-by-step check list for converting a system to this fluid, gives detailed information on its properties and past performance. In addition to physical and chemical properties of the snythetic fluid, the booklet gives a comprehensive list of suppliers of packings, seals, and other hydraulic components suitable for use with Pydraul F-9.

Fill in No. 166 on Reader Service Card

O-RINGS . . . for hydraulic and pneumatic systems are described in a new comprehensive catalog, published by The Garlock Packing Company. Divided into five sections, it describes O-ring materials, O-ring packings-dynamic, O-ring gaskets-static, back-up or non-extrusion rings and groove design for rubber O-rings. The catalog gives complete design information, recommended pressures, and illustrates typical O-ring applications.

Fill in No. 167 on Reader Service Card

RELAY SELECTION TABULATIONS . . . which show how to select a magnetically or mechanically held relay is featured in a catalog sheet, No. 553, offered by Automatic Switch Co. Publication points out that proper relay selection requires an evaluation of the maximum current the relay will be required to make, the maximum current which it must carry continuously and the maximum current which it must break. Information is tabulated in easy to read form, reference to a table indicates the proper relay for the application. Some circuit diagrams are illustrated.

Fill in No. 168 on Reader Service Card

AIR SYSTEM ACCESSORIES . . . such as check valves, relief valves and pressure control switches, specifically designed to meet the requirements of pressurizing systems in military aircraft and ground equipment are featured in Lear Inc., Lear-Romec Division's Product Data Sheet No. 2-93. All items are designed to operate uniformly, regardless of altitude, to maintain a pressure of clean, dry air. Illustrations, descriptions and specifications are shown.

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TUBING GUIDE . . . which condenses into 8 pages complete information needed for the selection and application of 46 principal analyses of tubing, is published by Superior Tube Company. This Bulletin 40, groups the 46 analyses into five classifications, stainless steel, nickel and nickel alloys, carbon and alloy steels, beryllium copper, and titanium. A short summary of the principal properties of each and its normal production limits is given. Length limits, straightness tolerance, standard temper designations and the commercial tolerances applicable to various size ranges are also described.

Fill in No. 170 on Reader Service Card

AIR CONTROL UNIT . . . known as Electroaire Valve, combines four-way slide valve, low voltage solenoid triggers, and independent speed controls in one integral package. Manufactured by The Bellows Co., the unit is featured in a new Bulletin, AV300R. This 8 page brochure shows installation photographs, and describes in detail all parts and functions of the unit, including dimensional drawings and specification data. Schematic wiring diagrams are also included.

Fill in No. 171 on Reader Service Card

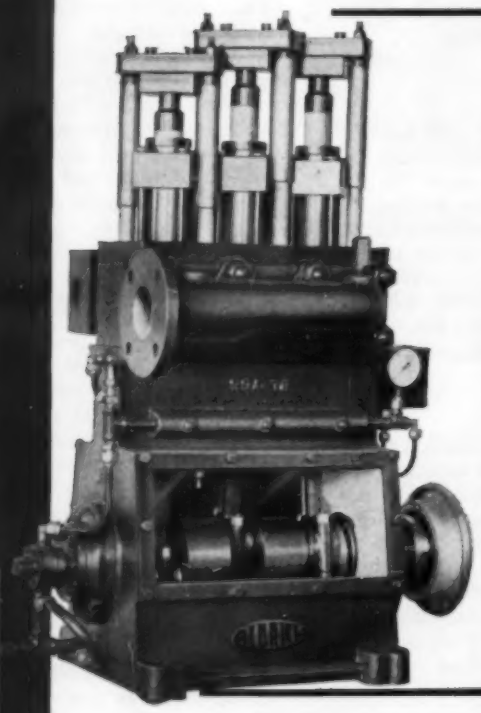
For more reviews of Free Literature turn to page 141

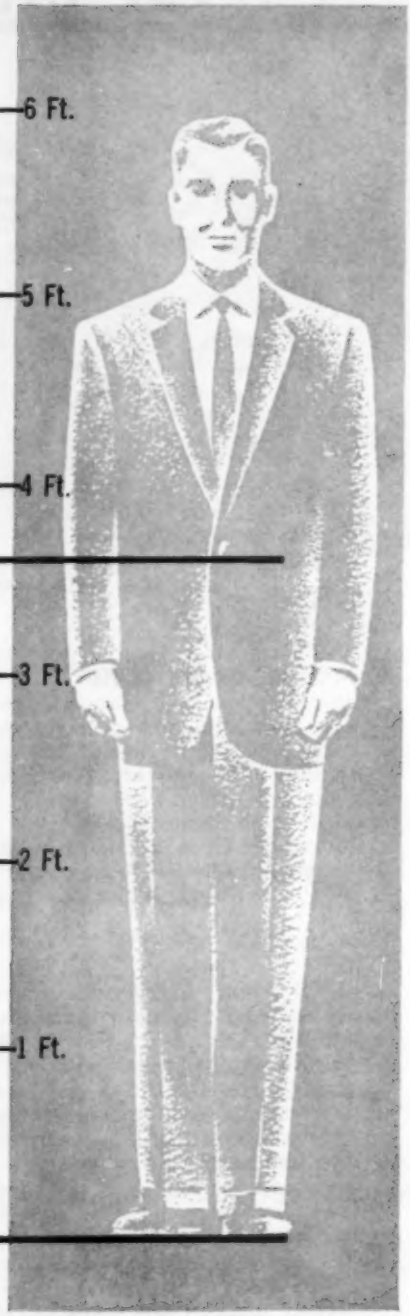
NEW "POWR-PAC"

2½" STROKE
25 HP
DIRECT FLOW
ALDRICH TRIPLEX PUMP!

This latest addition to the Aldrich line embodies all of the outstanding features of design and construction that have made Aldrich Pumps famous—plus low cost. Rugged construction assures long, dependable service life. Sectional fluid-end design provides maximum economy in maintenance and repair. Write today for descriptive Data Sheet 63.

Sizes: plunger diameters from 2½" to 1½" for pressures from 390 psi to 20,700 psi. Displacement from 109.6 gpm to 2.08 gpm (3758 to 71 bbls/day).





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DESCALING
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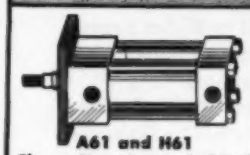
7722 Different Cylinder SELECTIONS—

Miller AIR AND HYDRAULIC CYLINDERS AND BOOSTERS "IN STOCK" for immediate delivery..

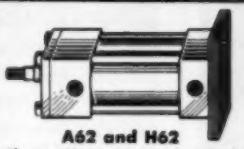
See Miller Bulletins A-105K (Air) and H-104K (Hydraulic) for Complete Dimensions and Engineering Data on these "in-stock" sizes and other Custom Miller Cylinders in bores up to 20" and strokes up to 22 feet.

"IN-STOCK" MODELS

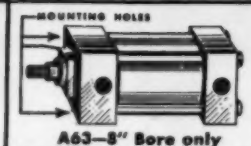
"A" Signifies Miller 200 psi Air Cylinders; "H", 2000 psi Hydraulic Cylinders. Interchangeable Mountings Are Shown in Red On Drawings.



A61 and H61
Flange Mounting on Rod End



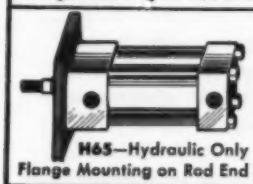
A62 and H62
Flange Mounting on Cap End



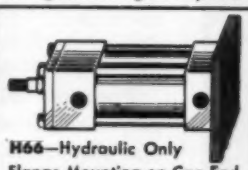
A63—8" Bore only
Flange Mounting on Rod End

A64—8" Bore only
Flange Mounting on Cap End

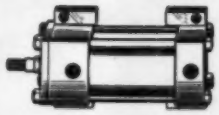
A50 & H50—Tie Rods not extended beyond nuts.
A51 & H51—Tie Rods extended both ends (shown).
A52 & H52—Tie Rods extended. Cap End only.
A53 & H53—Tie Rods Extended. Rod End only.
A54 & H54—Two Tie Rods extended at both ends.



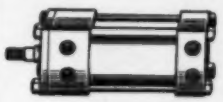
H65—Hydraulic Only
Flange Mounting on Rod End



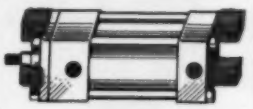
H66—Hydraulic Only
Flange Mounting on Cap End



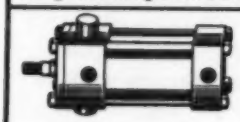
A72 and H72
Side Lug Mounting



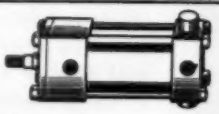
A74 and H74
Side Flush Mounting



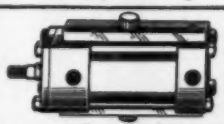
A77 and H77
Side or Foot Mounting



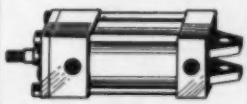
A81 and H81 Trunnion Mounting on Rod End



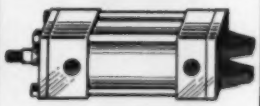
A82 and H82 Trunnion Mounting on Cap End



A83 and H83 Trunnion between Head and Cap (one week delivery)



A84 and H84
Pivot Mounting



A86 and H86
Pivot Mounting

IN STOCK BORES

"IN-STOCK" STROKES (in Inches)

	Bores	Rod Dia.	Rod Turn Down & Threads		1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
AIR	1½	⅝"	7/16-20	Cushioned																					
				Non-Cush.	1	2	3	4	5	6															
	2	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	⅝"	7/16-20	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	6	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	8	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
HYDRAULIC	1½	⅝"	7/16-20	Cushioned																					
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12									
	2	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	2½	1"	¾-16	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	3¼	1⅜"	1-14	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	4	1¾"	1¼-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
	5	2"	1½-12	Cushioned			3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36
				Non-Cush.	1	2	3	4	5	6	7	8	9	10	11	12	14	16	18	20	22	24	28	32	36

(1) "A" and "H" Models 82, 84 and 86 with strokes over 18" require stop tubes.

Column strength requires larger diameter piston rods for the following:

Air Cylinder Models A82, 84, and 86 with strokes inside area (1), when operated at 100 psi and over;

All hydraulic models with strokes inside area (2) and Models H82, 84, and 86 with strokes in area (4), when operated at 2000 psi and over;

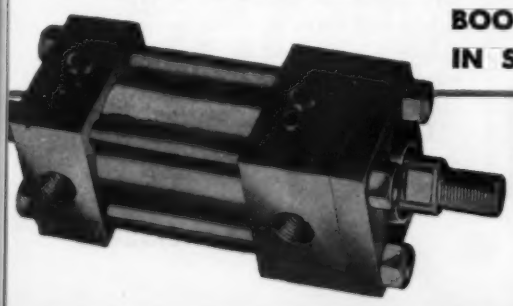
Models H82, 84 and 86 with strokes inside area (3), when operated at 1000 psi and over.

Depending upon Trunnion Pin location, "A" and "H" Models 83 with standard diameter piston rods can have longer strokes than Models 82, 84 and 86.

See Miller File #251 for oversize piston rod and stop tube requirements.

BOOSTERS IN STOCK

Immediate Delivery on the following Miller 25 to 1 Ratio Boosters (80 psi air input produces 2000 psi hydraulic oil output): Model B4, 5" bore, 1" dia. ram, 6" and 12" strokes; Reciprocating Booster Model DA77-RBAB, 5" bore, 1" dia. ram, 6" stroke. Also Booster Tanks, 5" dia., 6" and 10" heights.



Write For Catalog and Stock Price List

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(Formerly MILLER MOTOR COMPANY)
2008 N. HAWTHORNE AVE. MELROSE PARK, ILL.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS
COUNTERBALANCE CYLINDERS

WEAR-SAVERS THAT WON'T STEAL POWER

Hydraulic cylinder makers use Chicago Rawhide's Type G wiper seals for many reasons. Here's one: the special Sirvis leather wiper element holds its own lubricant—operates at low friction. This means negligible power loss. Another advantage: the Sirvis leather element will not trap grit and carry it—will not score the shaft. Years of dependable performance have demonstrated the ability of C/R Type G Oil Seals to exclude dirt, dust and moisture. They may be the answer to your problem, too. Write for your copy of "C/R Perfect Oil Seals."

C/R PERFECT Oil Seals

More automobiles, farm equipment and industrial machines rely on C/R Oil Seals than on any similar sealing device.

CHICAGO RAWHIDE MANUFACTURING COMPANY

1301 Elston Avenue OIL SEAL DIVISION Chicago 22, Illinois

IN CANADA: SUPER OIL SEAL MFG. CO., LTD., HAMILTON, ONTARIO

Other C/R products

SERVENE (Synthetic rubber) diaphragms, boots, gaskets and similar parts for critical operating conditions • CONPOR: Controlled porosity mechanical leather packings and other sealing products • SIRVIS: Mechanical leather boots, gaskets, packings and related products.

LETTERS to the editor

Pump Noise

The article by E. L. Midgette, on page 41 of the August 1954 issue is about a problem that is quite old and fully explained in Walter Ernst's book on hydraulics. I patented a solution to this problem in 1950. I think . . . cognizance of the old and known means must be evaluated first and full credit given to the discoverers.

MILO C. CAUGHREAN
San Francisco, Calif.

Professor Midgette's purpose in preparing his articles was to publicize the various methods available for reducing noise in positive displacement pumps. All the methods which he describes are not original with him or his engineering staff. While the solution for trapped oil in a gear pump has been published before, we feel that this information merits publication from time to time because this noise problem is still critical on many applications. As long as there are noisy pumps, new or old information about reducing the noise level is of value.

Shear-Type Valves

In your 32 page "Component Application Sheets" which was published in January, you have illustrated and pointed up two specific directional control valves—the spool type and the poppet type. I think it is generally accepted that the basic valve principles in the flow control industry are the poppet valve, spool valve, plug valve, plate valve, and shear-type valve. One of our most difficult problems has been to isolate the shear-type principle from the rotary plug, rotary spool or rotary plate type valves—all three of which have in common a rotating handle movement and at that point their similarity ceases.

I have reviewed the last paragraph on page 32 of the Component Application Sheets and think

that I am being fair-minded when I say that this describes a rotary spool valve which the shear-type valve is not.

M. C. NELSON
Barksdale Valves
Los Angeles, Calif.

We agree with Mr. Nelson that the description of the rotary spool valve is not adequate for the shear-type valve. In the shear-type valve, movement of the control handle moves a wear-resistant cast steel rotor. This rotor seals against hardened steel tubular sealing members. The term "shear-type" is derived from the shearing action between the flat lapped surfaces of the rotor and sealing members as the rotor is turned. Directional flow control is achieved through cored flow passages in the rotor which move in relationship to the stationary ports in the valve body. These tubular sealing devices fitted into each port in the body prevent leakage between the moving surfaces as the valve rotor is positioned. Perhaps the most distinguishing difference between a shear-type valve and a rotary spool valve is the flat lapped surfaces at which the ports in the rotor move in relation to the body. In the shear-type valve, these surfaces are flat and perpendicular to the center of rotation. The centerlines of the ports in the rotor and body (at the shear surface) are parallel with the center of rotation. Since the back surfaces of the sealing members are exposed to pressure, the sealing force increases as the pressure rises.

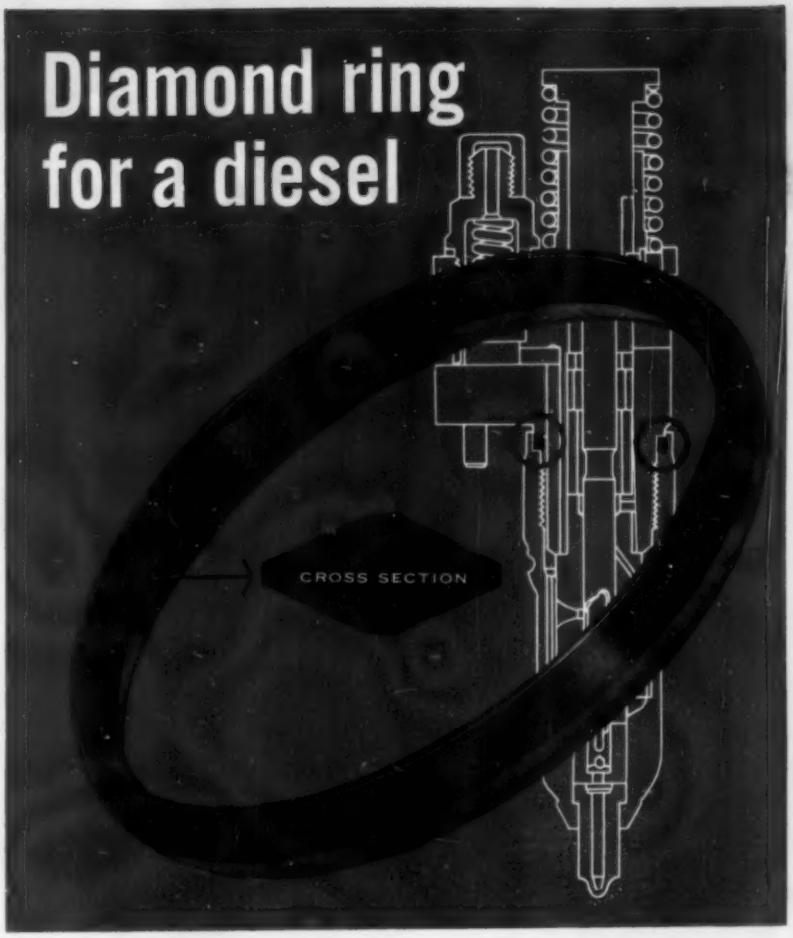
In a rotary spool valve, centerline of ports is usually perpendicular to the center of rotation. The ports come out of the periphery of the rotary spool. Shear-type design permits operation at air pressures to 4000 psi and oil pressures to 6000 psi. Such pressures cannot be handled by a rotary spool valve.

Giant Pumps and Motors

Just finished thumbing through the January Directory and Buyer's Guide issue of APPLIED HYDRAULICS, and I note it is bigger and better than ever.

Under the special section "Com-

Continued on page 40



ELIMINATES INJECTION NOZZLE LEAKS

Crankcase dilution can be a big headache. But not for one of the leading Diesel manufacturers. They knew that the right injection nozzle seal would cure a major cause . . . and came to C/R Sirvene engineers for help. C/R manufactured this Sirvene (synthetic rubber) part to extremely critical dimensions and physical properties to match the equally precise dimensions of the assembly. Result: no more leakage. When you need a unique pliable part, produced with precision quality, you need C/R Sirvene. Write us for your copy of "Engineering with Sirvene."

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1301 Elston Avenue SIRVENE DIVISION Chicago 22, Illinois

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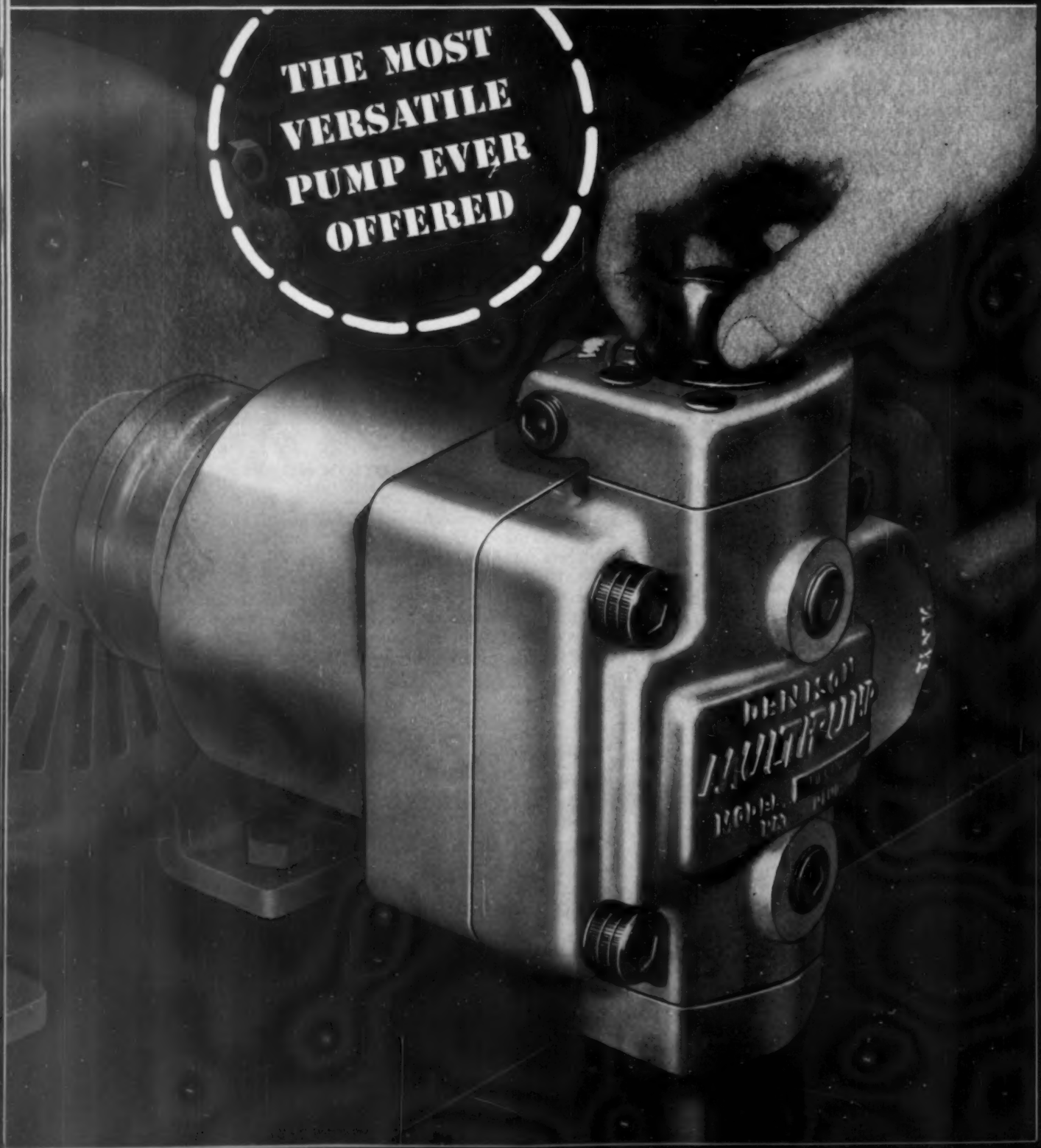
Another Denison First!



MULTIPUMP

VARIABLE VOLUME VANE PUMP

that gives you
variable volume at constant speed
PLUS constant volume at variable speed

Never before has a hydraulic pump offered such flexibility in operation . . . at such savings in operating cost. A revolutionary idea in pump design, Denison MULTIPUMP heralds these new advancements of major benefit to all industry.

NEW, EXCLUSIVE MULTIPUMP PRINCIPLE makes possible great savings in horsepower . . . by delivering only the oil needed by the circuit.

SIMPLE, UNIVERSAL CONTROL is exceptionally flexible in operation... handles requirements of most hydraulic circuits *without additional controls.*

FINGER-TIP CONTROL. Simple hand dial adjusts volume. Volume is maintained by MULTIPUMP regardless of variations in pressure and pump speed.

and in addition...

PRESSURE COMPENSATED, easily adjusted. Can be remotely controlled. Can be vented.

RUGGED, DEPENDABLE. Denison design uses exclusive fully-balanced vane construction.

COMPACT. Takes less space . . . weighs less than other variable volume pumps of equal capacity.

OPERATES COOLER. New Denison design principle circulates oil from tank at all discharge rates, even when pump is compensated.

3 STANDARD SIZES*. Adjustable flow up to:

5 gpm — 15 gpm — 25 gpm at 1200 rpm
7½ gpm — 22½ gpm — 37½ gpm at 1800 rpm
Maximum continuous working pressure...1000 psi

** Other sizes available on special order.*

SEND FOR FACTS

Operating characteristics, sizes and capacities of Denison MULTIPUMP are given in Bulletin 190. Write

THE DENISON ENGINEERING COMPANY
1166 Dublin Road • Columbus 16, Ohio
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DENISON Hydr OILics

MORE TO COME

Watch for announcements on other new Denison developments.

A pump for pressures *over* 5000 psi soon to be announced by Denison.

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an old principle —an extraordinary result

ball bearings rolling on a FLAT surface

- *offer less friction*
- *are easy turning*
- *wear longer*

It's an old principle, a ball rolling on a flat surface – making a single point of contact, and when applied to a ball bearing swivel fitting you get an extraordinary result – free and easy rotation even under extreme pressures. Compare EMSCO on this point!

Should you take the EMSCO fitting apart – and it's easy to do because it breaks like a union, you'll note a unique packing and ball race design which permits easy adjustment for wear. No expensive return of fittings to the factory for service. Note also how the large fluid passageways and smooth, easy contour of bends reduces turbulence and increases flow.

You'll find an EMSCO ball bearing swivel fitting for almost any application.

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LETTERS to the editor

ponent Application Sheets", we believe there is some information which can be brought up-to-date as a result of our heavy duty series of piston pumps and motors. Under Piston Motors you mention "Models are available to move loads requiring up to 300 hp at oil pressures of 3000 psi". We have built many models of hydraulic motors up to 700 hp and models are available for applications up to 4000 hp. Also, as you know, we have built a 2300 gpm pump which is being used on a tube reducing machine built by Bliss for Tube Reducing Corp.

M. SHAPIRO
Waterbury Tool
Division of Vickers, Inc.

Thanks, Mr. Shapiro, for prodding us. While we are very familiar with the Waterbury design and the size range, we've been slow to adjust our thinking to include such large sizes in a note about standard ranges. We certainly agree with you that a note pointing out the availability of these large sizes should be included in the "Component Application Sheets".

Wants a Training Course

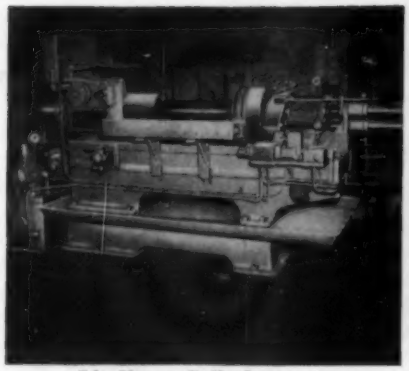
Can you tell me where in the East (Boston-New York vicinity) a machine designer can get a short "intensive training" course in the basics of hydraulic and pneumatic circuit design?

Do you know of any company in the field that has a manual or text available for training designers in hydraulic circuitry?

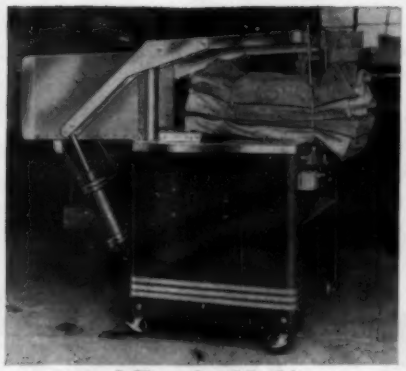
BERNARD KLEBAN
New Departure
Division of General Motors
Meridan, Conn.

We don't know of any school in your area which is presently offering an intensive training course for fluid power circuitry. There is, however, considerable literature available to help train designers. We have sent you a copy of the APPLIED HYDRAULICS *Data List*

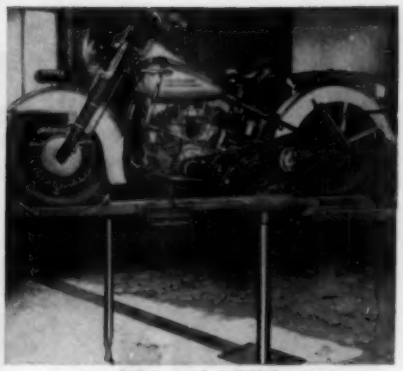
Continued on page 42



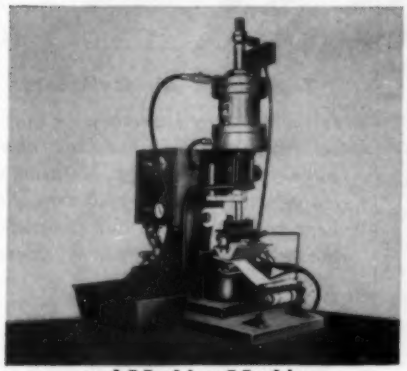
Lindberg Cylinders are used on Machine Tools



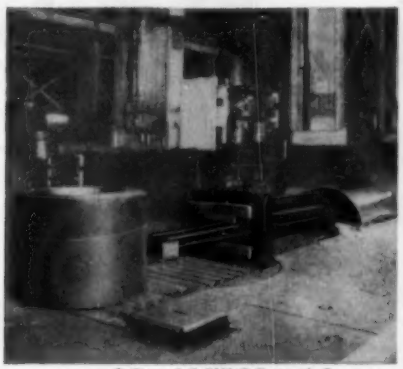
. . . and Clamping Machines



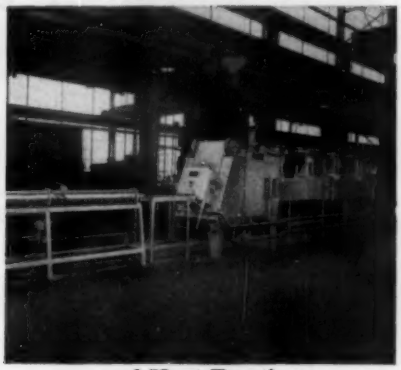
. . . and Material Lifting Equipment



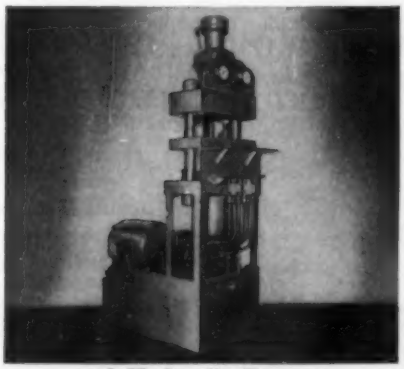
. . . and Marking Machines



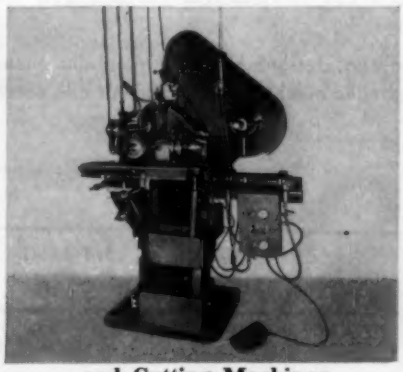
. . . and Steel Mill Material Handling Equipment



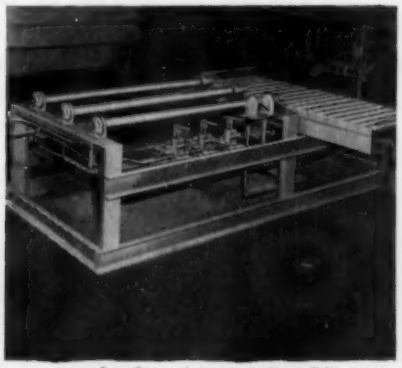
. . . and Heat Treating Furnaces



. . . and Hydraulic Presses



. . . and Cutting Machines



. . . and other Automation Lines

Push...Pull...Lift...Clamp

When original equipment needs muscle, manufacturers use *LINDBERG* cylinders

Visit Lindberg at ASTE Show, Booth No. 666 and at ASM Western Metal Exposition, Booth No. 334

Lindberg offers a complete line of Air and Hydraulic cylinders. All cylinders available to meet J.I.C. standards. Ask for bulletin No. 800.

LINDBERG AIR..HYDRAULIC CYLINDERS

Lindberg Air and Hydraulic Division, Lindberg Engineering Company, 225 North Laflin Street, Chicago 7, Illinois

YOU CAN BE THIS MAN!

He won a big award
In the APPLIED HYDRAULICS contest

HERE'S HOW: ENTER THE 1955 APPLIED HYDRAULICS PRIZE PAPER CONTEST WHICH OFFERS $1200 IN CASH

Anyone who uses, designs, builds or maintains pneumatic or hydraulic machines or equipment can enter this contest.

HERE'S WHAT YOU CAN WIN:

1st PRIZE	2nd PRIZE	3rd PRIZE
$500	$300	$200

. . . and 4th thru 7th prizes are $50 each. Also, all other papers judged as meriting publication will be paid for and published in APPLIED HYDRAULICS.

HERE'S HOW TO ENTER: WRITE US FOR AN ENTRY BLANK.

Along with suggestions to help prepare your article, we'll send you a reprint of last year's First Prize Paper. To win a cash award, your article must be mailed by June 1st, 1955.

Write today for your entry blank

APPLIED HYDRAULICS

1240 Ontario, Cleveland 13, Ohio

LETTERS to the editor

which summarizes the available text books and manufacturers literature. We have had inquiries from schools in your area which indicate that several schools may be planning courses in the field. Perhaps a reader seeing your letter can tell us if any progress is being made in establishing courses in your area.

T-J Makes Air Cylinders

In the January Directory we inadvertently omitted Tomkins-Johnson Company, Jackson, Mich. as a manufacturer of air cylinders. To keep your Buyer's Guide complete, please add T-J under air cylinders.

Has a Shock Problem

Would you please send me a reprint of the article "Hydraulic Shock" by Lee Drasin and Walter Stampfl which appeared in the October 1954 issue. This article won the first prize in the 1954 APPLIED HYDRAULICS Prize Paper Contest.

FRANK L. BAER
Western Engineering Dept.
American Smelting
and Refining Co.
Garfield, Utah

Reprints of this prize winning article are available and will be sent free to readers who request single copies.

Drawing Mistake

In the October issue, page 88, there is an error in the circuit drawing for the planer conversion. The main 1¼ inch 4-way valve shows open center on the published circuit drawing. This should show both cylinder ports to tank and pressure blocked and also spring centering. Proper circuit operation can only be had with the correct neutral porting.

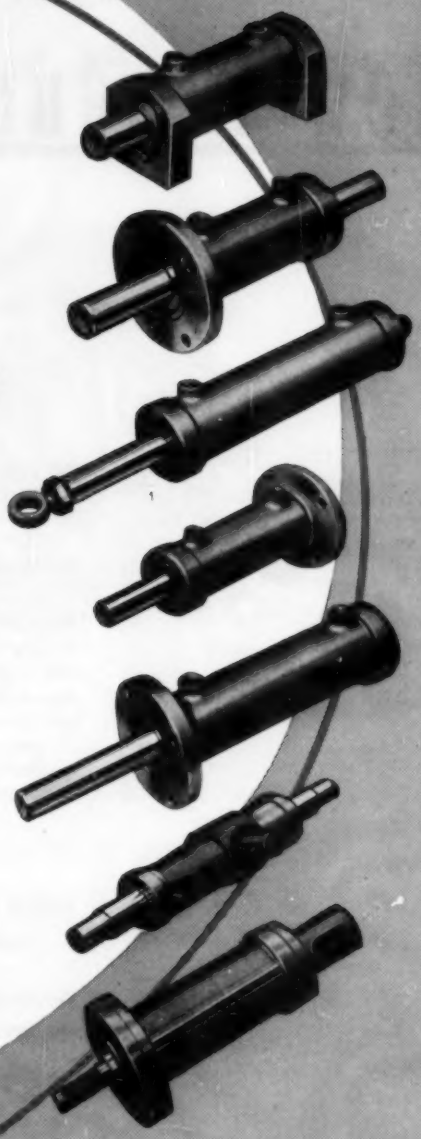
ROBERT R. PODGERS
Beverly, Massachusetts

Thanks for bringing this error to our attention.

Fill in No. 81 →

HEAVY DUTY

Hydraulic Cylinders



- **All steel construction—no tie rods, no castings.**
- **Hard chromed and ground piston rod to resist abrasion and prolong seal life.**
- **Self adjusting seals.**
- **Five standard mountings.**
- **Ample rod guide.**
- **Rod wiper seals fitted as standard.**
- **Cushioning at either end or both ends of stroke.**
- **Stroke length to suit your application.**
- **Standard range 2" to 6" bore, double acting.**
- **For working pressures up to 1,500 p.s.i.**
- **Double ended rods available for all standard cylinders.**
- **Special mountings, larger bores and cylinders for higher pressures by arrangement.**

Keelavite *hydraulics*

PUMP/MOTOR UNITS, VALVES, POWER PACKS, TRANSMISSIONS & REMOTE CONTROL SYSTEMS

The recognised Authority on Hydraulic Power Transmission

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FOR FULLER INFORMATION PIN THIS CORNER TO YOUR LETTERHEADING and post it to KEELAVITE ROTARY PUMPS AND MOTORS LIMITED ALLESLEY COVENTRY England

AH/81

New Products

Components, tools and equipment for fluid power systems. For more information fill in and mail post card bound in this issue.

FILTER-REGULATOR-LUBRICATOR

. . . protects air circuits

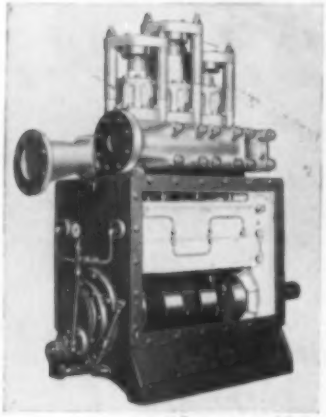
Designation: Aeropneumatic Control

Features: A new improved assembly for automatic conditioning and control of compressed air. By introducing the compressed air into the filter, pipe rust-scale-dust and 98 per cent of the free moisture is efficiently removed, and the entrainments deposited in filter bowl. Attached to filter bowl is an aquamatic trap which collects accumulated moisture and ejects it into a container or service drain.

Specifications: Unit is designed to handle standard range of air flow in pipe line sizes of ¼ inch through 1 inch.

Arrow Tools Inc.
Chicago, Illinois

Fill in No. 215 on Reader Service Card



HIGH PRESSURE PUMP

. . . features unique lubrication system

Designation: Series TP-5000

Design: Unit includes solid ceramic plungers; double roller main bearings; streamlined discharge manifold and self-adjusting packing.

Features: The vertical triplex pump design permits greater hydraulic power output per square inch of floor space. 100 per cent pressure lubrication to crosshead guides, crosshead pin bearings and crank pin bearings is assured by the system of pressure lubrication.

Applications: For use on central hydraulic power systems, hydraulic presses, shears and power systems, molding, forming and extrusion operations.

Specifications: Units are available in capacities from 9 gpm to 260 gpm and pressures from 600 psi to 5000 psi.

Ajax Iron Works
Corry, Pennsylvania

Fill in No. 216 on Reader Service Card

PROTECTIVE DEVICE

. . . for hydraulic flow control valves

Designation: Flow Control Lock

Construction: Unit consists of a mounting plate, sidewalls and a hinged locking cover. The valve nameplate and adjusting lever are removed. Mounting plate is inserted under these parts, after which they are screwed back into place.

Features: Unit is designed to prevent unauthorized persons from tampering with the hydraulic feed setting on production machine tools. After desired feed has been set, cover is closed and locked with a key operated barrel-type lock. Lock is compact, takes up same area as the face of the valve body, and projects only enough to allow clearance over the feed setting lever.

The Cross Company
Detroit, Michigan

Fill in No. 217 on Reader Service Card

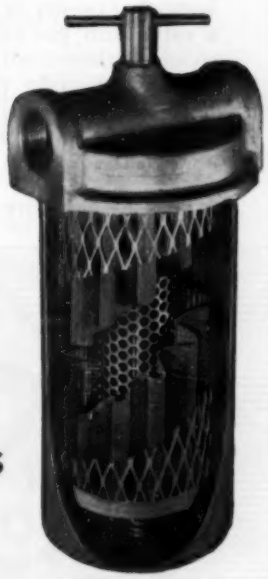
Continued on page 47

Simplify Your Preventive Maintenance

SUMP TYPE (Cutaway)

with

MARVEL SYNCLINAL FILTERS



LINE TYPE (Cutaway)

For All Hydraulic and Other Low Pressure Liquid Systems
SIMPLE, EFFICIENT DESIGN
REDUCES DEMAND ON YOUR SKILLED MAINTENANCE HELP

ANY WORKMAN can disassemble, clean and reassemble Marvel Synclinal Filters. Cleaning is done quickly, and Marvel's extra capacity requires less frequent cleanings. This means more production per machine with less man hours. Marvel protected machines spend their time producing, not in being serviced and repaired. Marvel's BALANCED Synclinal Design and simple efficiency changes down-time to producing time.

STANDARDIZE WITH MARVELS
CHOICE OF OVER 500 ORIGINAL EQUIPMENT MANUFACTURERS

Improve your all-important preventive maintenance by simplifying it. Use Marvel Synclinal Filters throughout your plant. Specify Marvel on new machines, add Marvel to present machines. No moving parts to wear, nothing to keep in stock. Your first cost is your only cost.

A SIZE FOR EVERY NEED

Available for sump or line installation in capacities from 5 to 100 G. P. M. Greater capacities may be attained by multiple installation (as described in catalog). Choice of monel mesh sizes range from coarse 30 to fine 200.

WATER FILTERS

Both sump and line type filters have been adapted for use in all water filtering applications. No changes have been made in the basic, balanced synclinal design.

IMMEDIATE DELIVERY!

As in the past, Marvel continues to offer IMMEDIATE DELIVERY.

FILTERS FOR NON-FLAMMABLE HYDRAULIC FLUIDS

Marvels most recent development is a filter for the efficient filtration of all types of non-flammable hydraulic fluids.

Catalogs containing complete data available on request

MARVEL ENGINEERING CO.

625 W. JACKSON BLVD., CHICAGO 6, ILL.
PHONE: FRANKLIN 2-4431 & FRANKLIN 2-3530

Without obligation, please send me complete data on Marvel Synclinal Filters as indicated:

Catalog No. 106 for Hydraulic Oils, Coolants, Lubricants
Catalog No. 300 for Water
Data on filters for non-flammable hydraulic fluids

AH-3

Name _____ Title _____

Company _____

Address _____

City _____ State _____

OUR IDEA WAS TO BUILD A BETTER VALVE...

Seemed like a sound one to us.

Machines and methods had improved. Automation came along. But air valves had been basically unchanged for twenty years. Too bulky, too complicated, too difficult to service, in our estimation.

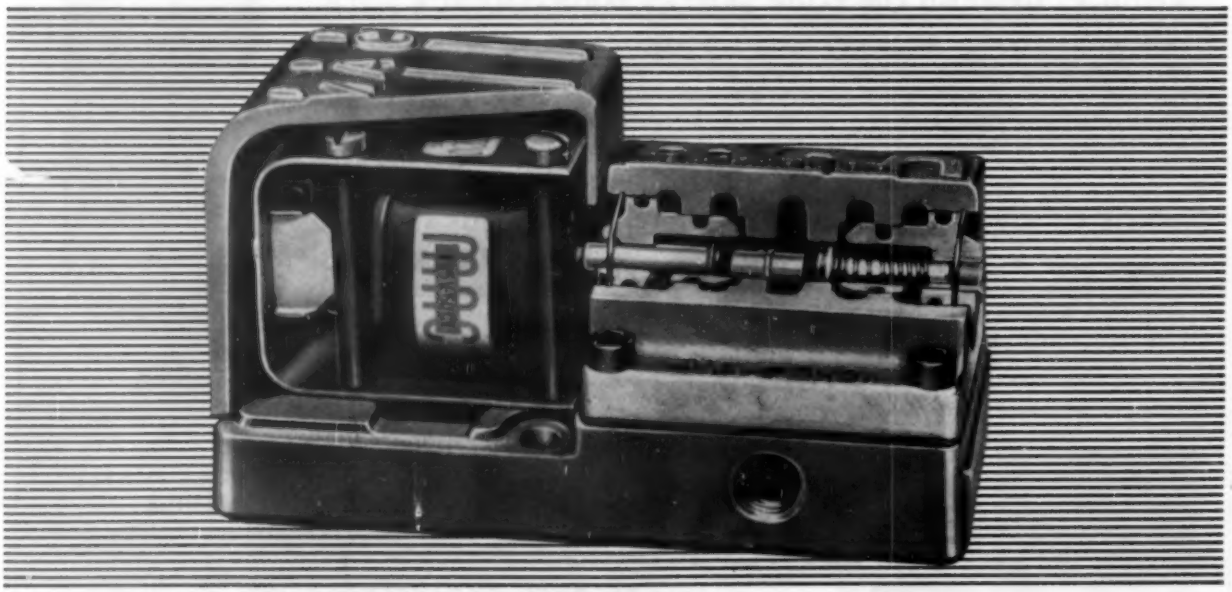
So, here at MAC, we simplified air valve design.

Instead of twenty or thirty parts, we engineered a valve with just eleven. Only *one* moves—the spool—so there's only one to wear. Our valve is lightweight—eight pounds, instead of ten to eighteen. And smaller. The ⅜", 4-way MAC solenoid air valve, for example, is just 3"x3"x7" —about the size of a pound of butter.

It's the easiest valve we know of to service. You can get at the spool by simply removing the retainer. No need to touch the piping at all. For that matter, a MAC valve seldom *requires* maintenance. On the toughest jobs, our valves have run for *millions* of cycles without being touched, thanks mainly to precision workmanship with only the most reliable of materials and the quality checks every valve must pass before it leaves our plant.

If you like the idea of simplicity in valve design—better performance at lower cost—get in touch with us. Nothing will please us more than to have you *compare* MAC valves. We'll be happy, also, for the chance to lend our "know-how" to any air control application you have in mind.

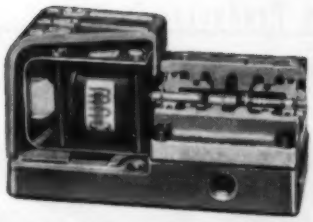
No obligation, of course. Write us now.



CUTAWAY VIEW OF ¼", 4-WAY MAC solenoid-operated spring return air valve. A complete line of valves for virtually any application is available. Standard, or made to order.

MECHANICAL AIR CONTROLS, INC.
10030 Capital, Oak Park, Detroit 37, Michigan

MAC



SEE YOUR NEARBY "MAC" REPRESENTATIVE FOR DATA AND DELIVERY

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OAKLAND—The Rucker Company, 4700 San Pablo Ave., Oakland 8, OLympic 3-5221
SOUTH GATE—The Rucker Company, 4956 Firestone Boulevard, South Gate, KImball 8271

GEORGIA
ATLANTA—Edward M. Watkins & Associates, 3230 Peachtree Road, N. E., Atlanta, Exchange 5664

ILLINOIS
CHICAGO—Mechanical Air Controls, 10336 South Western Avenue, Chicago 43, Hilltop 5-3640

INDIANA
FORT WAYNE—Neff Engineering Company, P. O. Box 2001, Station A, 2339 Crescent Avenue, Fort Wayne 3, EAstbrook 7391
INDIANAPOLIS—Jack Neff, 42nd St. Station, P.O. Box 7361, Indianapolis, HUmbolt 6421
SOUTH BEND—Dick Futter, 103 South Varsity Drive, South Bend, 2-4856

MASSACHUSETTS
BOSTON—Electrical Apparatus Company, Inc., 1200 Soldiers Field Road, Boston 34, STadium 2-7440

MICHIGAN
BAY CITY—Fred Kober, 506 Chilson Street, Bay City, 2-2629
FLINT—Kober Sales Engineering Company, 514 Beach Street, Cedar 8-5123
GRAND RAPIDS—Kober Sales Engineering Company, 190 Monroe Avenue, Grand Rapids, GLendale 4-3252

MINNESOTA
MINNEAPOLIS—Air Engineering & Supply Company, 2445 Nicollet Avenue, Minneapolis 4, Fillmore 5579
ST. PAUL—W. H. Schulz Company, 2438 Franklin Avenue, St. Paul 14, MIdway 2744

MISSOURI
ST. LOUIS—Oscar E. Jost, 2849 Sidney Street St. Louis 4, PRospect 3-4790

NEW YORK
BUFFALO—C. H. Tepas Company, 200 Washington Highway, Buffalo 21, CIrcle 3210
NEW YORK—C. H. Ribble Company, 261 Broadway, New York 7, WOrth 4-6227

OHIO
CINCINNATI—R. W. Nichols Company, Fidelity Federal Savings Building, 2087-9 Sherman Avenue, Cincinnati, Norwood, ELmhurst 2440
DAYTON—R. W. Nichols Company, 407 Realty Building, Dayton, MIchigan 4724
OLMSTED FALLS—R. W. Nichols Company, P. O. Box 6, Olmsted Falls, BErea 4-1379
TOLEDO—R. W. Nichols Company, 510 Manhattan Building, Toledo 4, MAin 8623
YOUNGSTOWN—R. W. Nichols Company, 202 Schwenn-Wagner Building, Youngstown 3, RIverside 4-4550

OREGON
PORTLAND—The Rucker Co., 911 N. W. Hoyt Street, Portland, BEacon 0205

PENNSYLVANIA
PHILADELPHIA—Grand Air Hydro Division, K. Wm. Ostrom & Co., Inc., 3717 Filbert Street, Philadelphia 4, EVergreen 2-5444

TEXAS
DALLAS—Womack Machine Supply Company, 6409 Maple Avenue, Dallas 19, DIxon 6997

WASHINGTON
SEATTLE—The Rucker Company, Whyte-Henry-Stuart Building, Room 203, Seattle, MAin 2783

WISCONSIN
MILWAUKEE—Neff Engineering Company, 2837 North 50th Street, Milwaukee, HIlltop 5-3340

CANADA
ONTARIO, HAMILTON—Higginson Engineering Sales, P. O. Box 23 (275 James, North), Hamilton, Ontario, JAckson 9-2262

MECHANICAL AIR CONTROLS, INC.
DETROIT 37, MICHIGAN

MAC

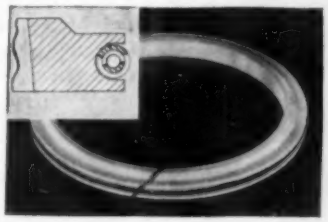
New Products continued

SCRAPER RINGS

. . . for industrial and aircraft use

Designation: S-11065

Features: These rings are precision made to aircraft tolerances from low-friction, non-scoring, tough and extremely inert Kelon-T or Kelon-Y. They are responsive to



rod misalignments, have less friction, do not score the rod. The spring loaded ring maintains firm contact on the rod and absorbs wear. Operating temperatures range from minus 100 degrees to plus 300 degrees F.

Sizes: Available in 73 sizes for rods ranging from ½ inch O.D. to 13 inches O.D.

W. S. Shamban & Co.
Culver City, California

Fill in No. 218 on Reader Service Card

BOURDON PRESSURE GAUGE

. . . features bifocal pointer

Features: This new 19½ inches indicator, with an equivalent linear length of 55 inches, provides in-

creased accuracy, greater visibility and easier reading of pressure. Bifocal pointer and high visibility dial permit simplified reading from a distance. Dial scales are individually calibrated at twenty different points to insure uniform dependable accuracy. Pointer zeroing is accomplished with special locking knob which provides stable zero settings over 20 percent of the dial range.

Specifications: Gauges are available in a wide variety of ranges to 100,000 pounds capacity.

The A. H. Emery Co.
New Canaan, Connecticut

Fill in No. 219 on Reader Service Card

HOSE ASSEMBLY MACHINE

. . . offers ease and speed

Designation: Model 232

Design: Wrenchless chucking device speeds clamping of the fitting parts. Mandrel attachment, for the different inside diameter sizes of hoses, eliminates danger of scoring the hose inner liner. The motor is reversible, permitting machine to be run in either direction of mo-

tion, for detachment as well as assembly of reusable fittings.

Features: The fitting socket turns quickly into the hose, and similarly the nipple screws into the socket, by means of a power-driven spindle. A jog switch gives operator control of the speed when assembling fittings onto the hose.

Specifications: Unit is 44 inches long, 25 inches wide, 46 inches high; weighs 585 pounds; handles fittings from 3/16 to 1 1/2 inches.

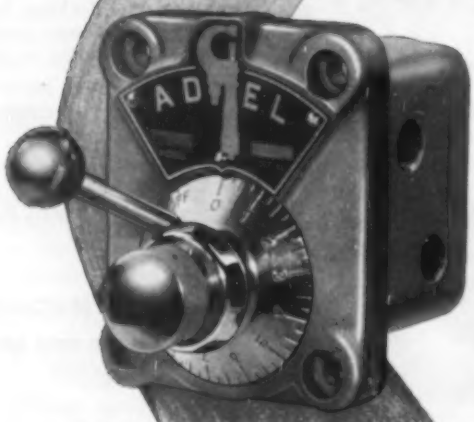
The Parker Appliance Co.
Cleveland, Ohio

Fill in No. 220 on Reader Service Card

Continued on page 48

THE NEW ADEL

FLOW CONTROL VALVE FOR VERSATILITY



Adjustable from completely shut off position to 25 G.P.M. maximum flow. Will maintain constant fluid flow and constant machine feed over a wide range of pressures and feed resistances.

The diagrams show but two of innumerable circuits and systems where this versatile and better valve can be used to advantage.

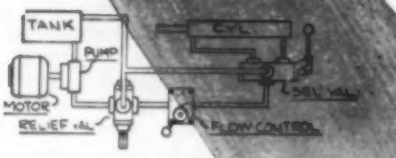


Diagram illustrates typical circuit showing control of cylinder.

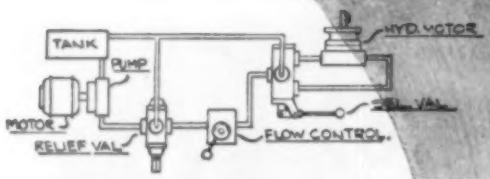


Diagram illustrates typical circuit showing control of hydraulic motor.

8 model variations are available—¼ in. Pipe Size—1, 2, 4 & 6 G.P.M. Flow Max. ½ in. Pipe Size—10, 15, 20 & 25 G.P.M. Flow Max.

CHARACTERISTICS

1. Valve is compensated type which maintains substantially a constant flow regardless of variation in inlet and outlet pressure.
2. Maximum recommended inlet pressure 1500 P.S.I.
3. Maximum recommended outlet pressure equals inlet pressure minus 100 P.S.I.
4. No drain line required.
5. Wide range of control lever rotation (270°) permits extremely accurate flow settings.

For complete engineering specifications and counsel, Address: ADEL DIVISION—GENERAL METALS CORPORATION, 10771 Van Owen Street, Burbank, California.

ADEL
PRECISION PRODUCTS
A DIVISION OF GENERAL METALS CORPORATION

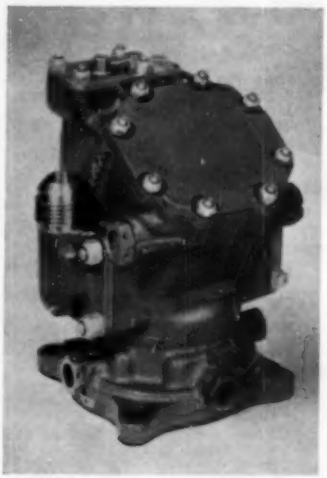
Manufacturers of Industrial Hydraulic Control Equipment

DISTRIBUTORS: AIR-DRAULIC EQUIPMENT CO., HOUSTON, TEX. • AIR & HYDRAULIC ENGINEERING CO., NEW HAVEN, CONN. • RUSS CHAMBERLIN COMPANY, PORTLAND 14, ORE. J. BOYD COATES, GLENSIDE, PA. • CORBY SUPPLY COMPANY, ST. LOUIS, MO. • FRANK T. DONNELLY COMPANY, PITTSBURGH 38, PA. • HASKEL ENGINEERING & SUPPLY CO., GLENDALE 4, CALIF. • HASKEL ENGINEERING & SUPPLY CO., SAN FRANCISCO 7, CALIF. • AIR-DRAULICS COMPANY, PHOENIX, ARIZ. • INDUSTRIAL AIR & HYDRAULIC EQUIP. CO., DETROIT 15, MICH. LINCOLN SUPPLY COMPANY, PROVIDENCE, R. I. • L. H. MONSEES, INDEPENDENCE, MO. • THE NEFF ENGINEERING CO., FORT WAYNE 3, IND. • POWER DRIVES, INCORPORATED, BUFFALO, N. Y. • SCOTT EQUIPMENT & ENGINEERING CO., DAYTON 10, OHIO • ROBERT TAYLOR & SONS, SALT LAKE CITY 10, UTAH • WYATT SALES COMPANY, CLEVELAND 15, OHIO
TRI-STATE SUPPLY COMPANY, BROOKLYN 33, N. Y.

New Products / continued

PUMP DESIGN
. . . gives reduced weight

Features: This new line of variable displacement piston-type aircraft hydraulic pumps has a redesigned yoke of cast alloy steel and a lightweight magnesium zirconium alloy pump housing, which contribute to a weight reduction up to 37 percent. The new design operates with lower critical inlet pressures.



Specifications: Designed for 3000 psi operation, it is available in sizes having normal rated deliveries, at 1500 rpm, from 0.60 to 23 gpm. Smaller size pumps can operate at speeds as high as 9100 rpm. Operating temperature range in minus 65 degrees to plus 160 degrees F. Specially equipped pumps permit temperatures beyond these limits.

Vickers Incorporated
Detroit, Mich.

Fill in No. 221 on Reader Service Card

PRESSURE SWITCH
. . . senses difference between two varying pressures

Designation: Meletron Model 462

Features: Unit will actuate an electric circuit on increase or decrease of any predetermined pressure difference within the range of the switch selected. It's readily adjusted

Continued on page 50

Logan air valves

A model to effectively meet practically any air control valve requirement.
Designed to assure maximum efficiency with a minimum of maintenance.

Model 6550
Air Control Valve

82 models

most models stock delivery

Logan Air Control Valves are designed and built to assure an unusually high standard of performance plus maximum convenience for the design engineer, machine operator and maintenance man. Every construction detail has been planned to make Logan valves easy to install, to use and to service.

Thousands of manufacturers have found Logan valves to be the answer to their production problems. Logan engineers are at your service to help you achieve better, more efficient production. Following are a few facts about Logan Air Control Valves:

Standard valve models are available in a wide range of mounting types, means of actuation, type of handle and sizes.

Can be located in any position on horizontal, vertical or other surfaces. Mounting is simple.

Construction is compact—permits installation in limited space, close to other equipment.

All valves are built for operating pressures to 150 psi. For reuse, many Logan valves can easily be converted to other types. Parts are interchangeable.

The wide choice of types of control makes it possible to provide the most convenient type of actuation for every problem of regulation.

Effortless control is provided in all models. Balanced construction produces equal pressure on both sides of piston.

Valve piston is light in weight, permitting high-speed operation without excessive vibration or wear.

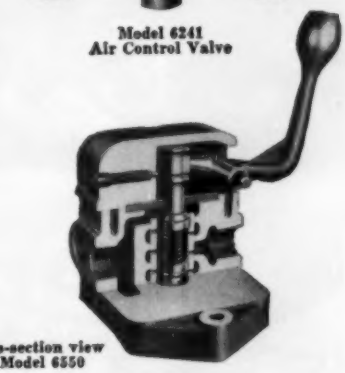
Long-life synthetic rubber cup packings on valve piston assure positive action without leakage.

Piston-type valve with sliding piston eliminates valve seats; minimizes wear.

Self-cleaning construction means longer sealing life.

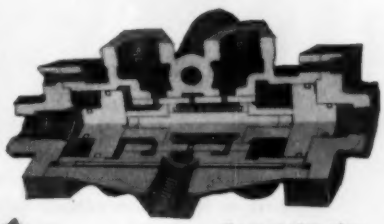
Valves are unusually easy to repair or recondition. Simply by removing cover screws—covers and valve piston can be quickly removed and replaced.

If a few spare pistons are carried in stock, a Logan air valve can be reconditioned with only a few minutes of downtime. Write for Logan Catalog 100-4.



Model 6241
Air Control Valve

Cross-section view of Model 6550



Cross-section view of Model 6241

Let Logan Engineers help you design your Air and Hydraulic Circuits. No obligation.

MEMBER—
National Tool Builders Assn.
National Fluid Power Assn.

LOGAN MANUFACTURES 7,023 STANDARD CATALOGED ITEMS

FREE CATALOG ON REQUEST

AIR CONTROL VALVES, Cat. 100-4 • AIR CHUCKS, Cat. 70-1 • AIR CYLINDERS, Cat. 100-1 • AIR-DRAULIC CYLINDERS, Cat. 100-3
AIR and HYDRAULIC PRESSES, Cat. 51 • COLLET GRIP TUBE FITTINGS, Cat. 200-5 • HYDRAULIC CONTROL VALVES, Cat. 200-4
HYDRAULIC CYLINDERS, Cats. 200-2; 200-3 • HYDRAULIC POWER UNITS, Cat. 200-1 • SURE-FLOW COOLANT PUMPS, Cat. 62

SAVES TIME — Logan AIR AND HYDRAULIC EQUIPMENT — EFFORT • MOTION

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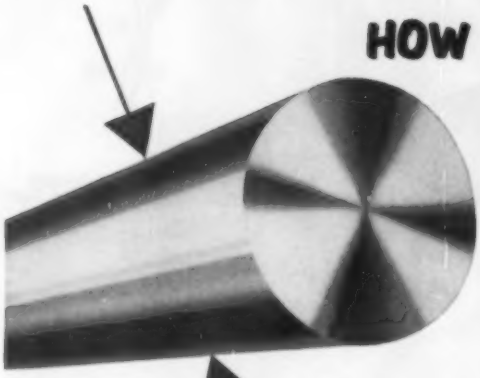

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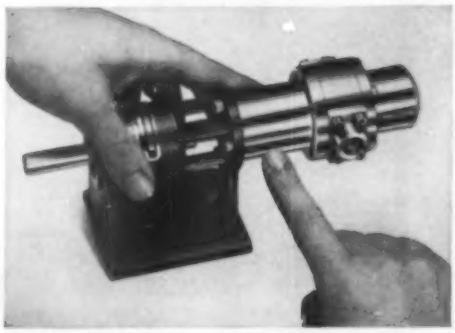
This Waterbury Tool Co. pump shaft (8⅝" dia.) is sealed permanently by the compact Sealol Seal shown in the man's hand. The pump operates at a speed of 400 RPM and the pressure at the seal is 10 psi. Fluid being sealed is DTE MEDIUM oil.



SMALL SEAL

This Eastern Industries Type 104 RST pump is designed to handle water, chemicals, and other non-lubricating liquids. The compact housing incorporates a tiny Sealol Seal to seal the ¼" shaft, rotating at 1750 RPM. Sealing pressure: up to 60 psi.

Sealol offers outstanding shaft sealing solutions. Present designs are handling pressures to 1500 psi, rubbing speeds to 15,000 fpm., operating temperatures to 500°F. The "application horizon" of Sealol Seals is constantly being extended by our research and development team. Tell us about your shaft sealing problems . . . chances are we have a workable, practical, and economical answer for them. Send details today, or ask for our new Bulletin 7.

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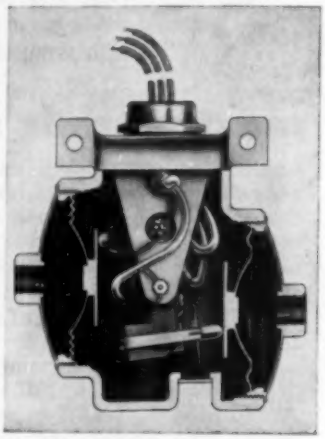
New Products continued

by means of an adjustment ratchet. The switch operates in any position. Functions of the switching or pressure sensing elements are not effected by jarring on mobile installations or by vibrations from pumps and compressors. Tamperproof cover protects setting against accidental disturbance.



Specifications: Working range is .05 to 100 psi. Differential range is 0 to 99 psi.

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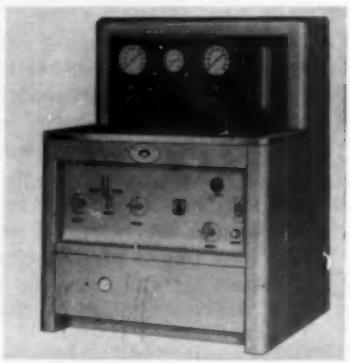
HYDRAULIC TEST STAND . . . for 3000 psi systems

Designation: Model S-1000-6C3



Features: Unit is completely self contained in a heavy-gage all-steel welded cabinet and is equipped with all necessary instrumentation and controls, including flow control valve, flowmeter and oil cooling circuit. Controls are out in front easy to

Continued on page 54

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Design engineers have confidence when they specify dependable Eastern Hydraulic Pumps and Fluid Motors. Exclusive Eastern features create an economical, reliable, and compact unit for the heart of your hydraulic mechanism.

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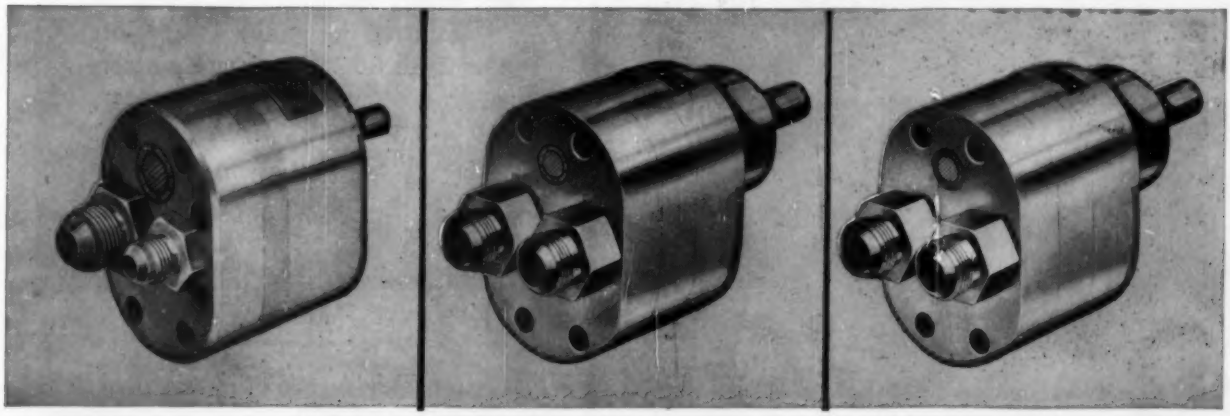

100 Series — Heavy duty gear pump. Delivery from .1 to 5 gpm and working pressures up to 1,500

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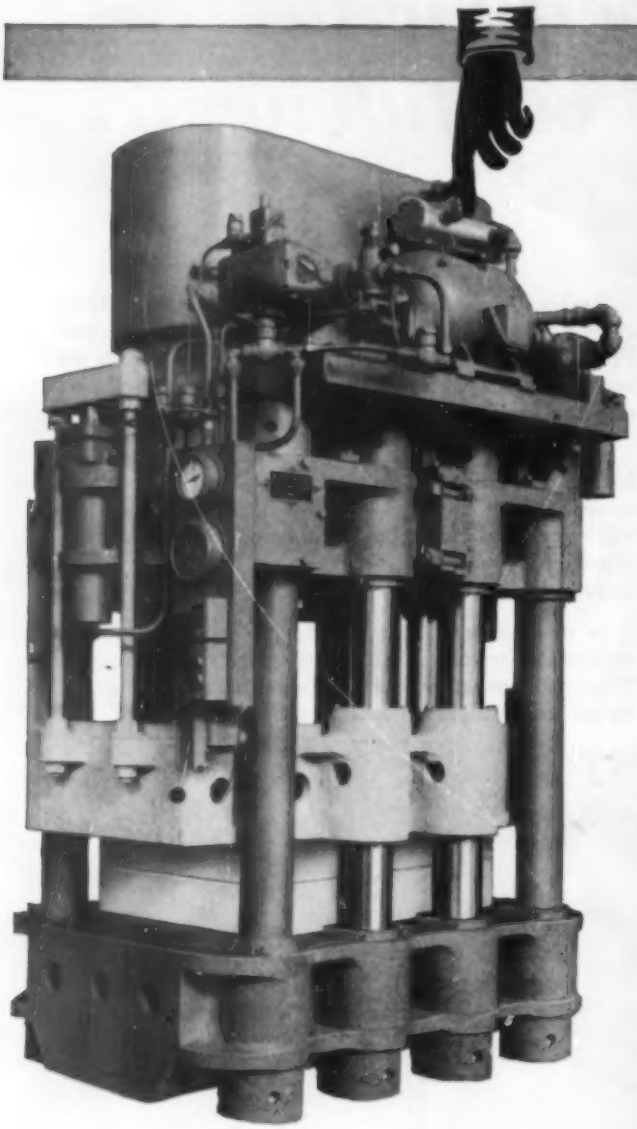
keeps hydraulic power at peak level in this Birdsboro Press



Injecting plastics into propeller blades, this eight-posted, 900-ton Birdsboro Hydraulic Press has been designed and built "to pack more production wallop into every foot of floor space."

To keep hydraulic power at its peak, by preventing pump slippage from overheated, thinned oil, Birdsboro Steel Foundry & Machine Co. equipped this press with a Ross Type BCF Exchanger. Safe, dependable cooling is thus assured!

Regularly installed on numerous types and makes of hydraulic machinery, Ross Exchangers are ruggedly built to withstand punishing hydraulic shock. Tough, ductile, seamless copper alloy shell and brass forgings can well absorb the extra load.

Unexcelled for thermal efficiency, Ross Type BCF Exchangers are completely pre-engineered, fully standardized and stocked in a wide range of sizes to meet most needs...promptly.

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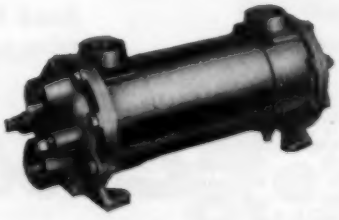

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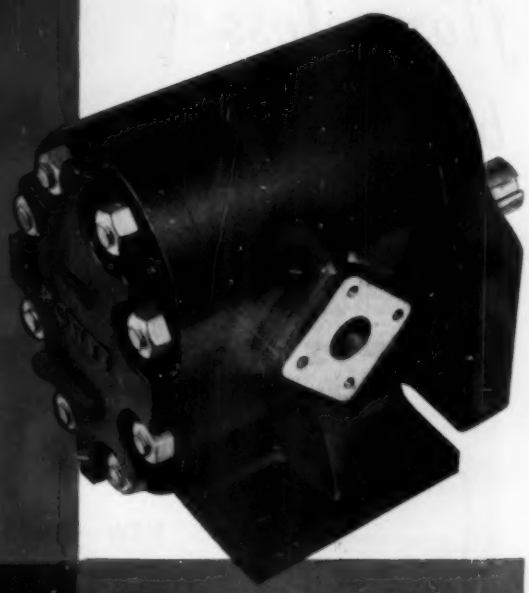

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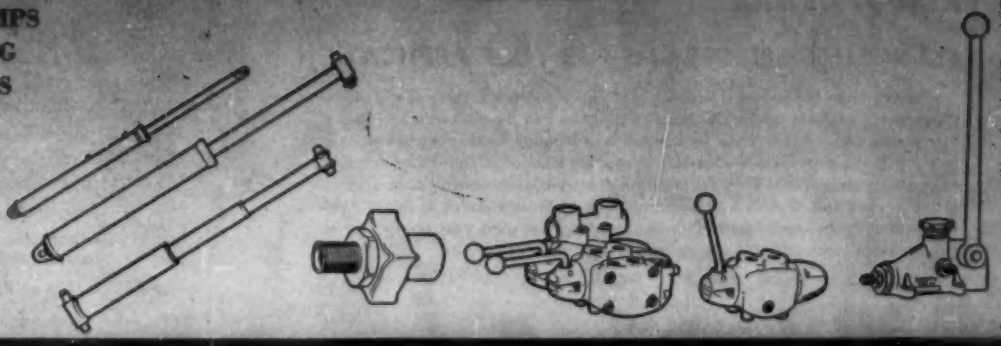

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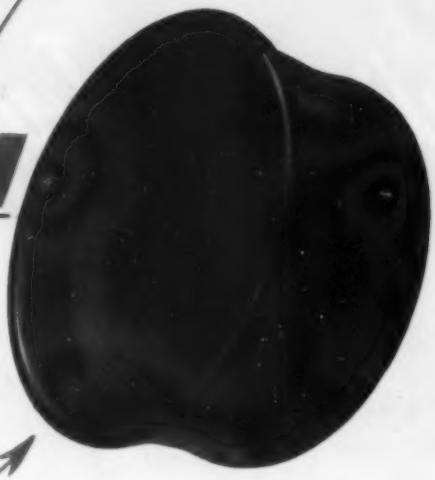
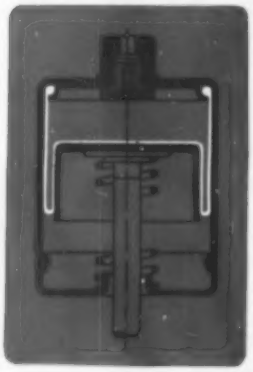


Bellofram*

PISTON SEAL



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The new solid head Class 1 Bellofram is a long stroke, deep convolution piston seal diaphragm developed for all pressure sealing applications. With the "O" ring bead-seal characteristic, it will operate efficiently at pressures up to 500 p.s.i. — or up to ten times the rating of ordinary diaphragm seals.

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Actuators using Class 1 Belloframs have longer stroke — are smaller, lighter, much easier to design and manufacture — do not require costly machining or precision alignment. Bellofram's *rolling action* (not sliding) minimizes friction losses. Dynamically stable Belloframs are made of modern fabrics and elastomers for high resistance to fatigue and extreme cycle life. The bead is not subject to operational stress, due to provable wall-friction coefficients and narrow semi-circular convolution of diaphragm under pressure.

FLANGELESS BELLOFRAMS FOR *YOUR* APPLICATION

Put this major improvement in piston seal design to work for you now. Bellofram's unduplicated features include resistance to vibration and chemical action — operation over a wide temperature range — elimination of leakage — control of effective area to within 0.1% over complete working stroke. No lubrication needed — no maintenance except simple, infrequent replacement — accurate, economical operation where ordinary seals fail. Outline your application and submit a sketch to find out how a standard or custom-engineered Class 1 Bellofram can solve your pressure application problems. Your data considered confidential. Write today.

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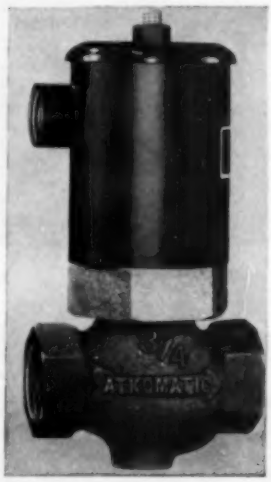
Operation: When solenoid is energized, the coil lifts pilot valve



assembly from the pilot valve orifice relieving the pressure on top of the piston. When there is no line pressure, the pilot valve assembly engages the piston, directly lifting it from the full port area. This assures positive opening even at 0 psi. When solenoid is de-energized a spring over the piston provides positive closing.

Sizes: Available to fit ½, ¾ and 1 inch pipe sizes, operates from 0 to 150 psi.

Atkomatic Valve Co.
Indianapolis, Indiana

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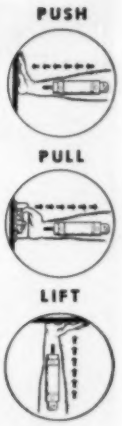

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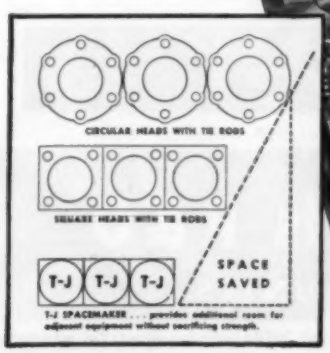
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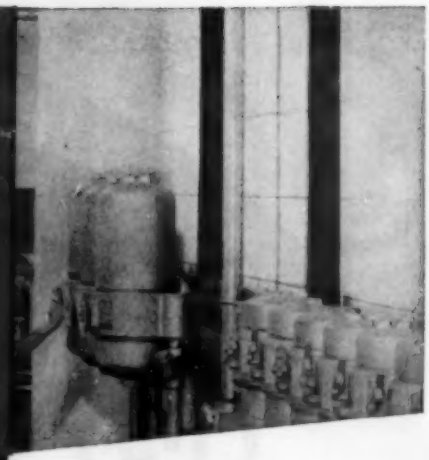
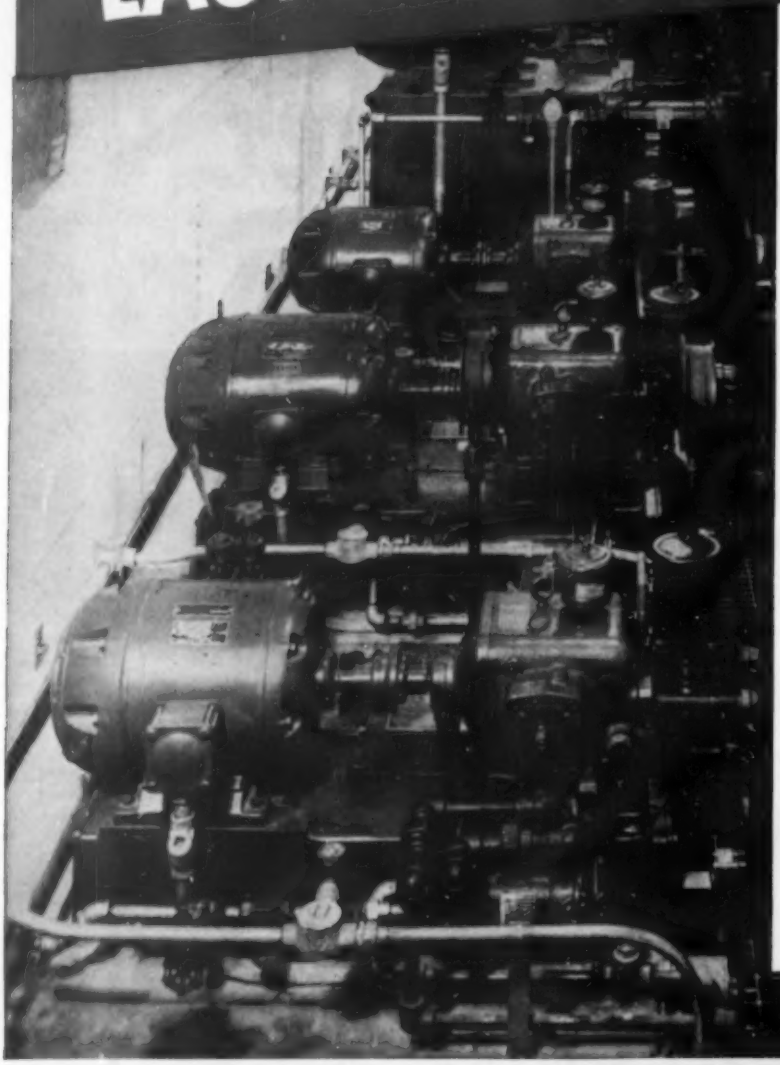
WHY HYDRAULIC PUMPS LAST LONGER





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1. TRACER CIRCUIT OPERATION can be reversed so that either the cam or the work piece can be cut on this slotter. Here the work piece is being machined.

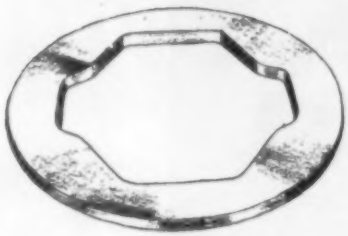
Accurate Radial Contours with TRACER CONTROL

• By Earle W. Johnson and Stanley A. Bjorklund

DEVELOPMENT of servo mechanisms, while comparatively recent, has made possible spectacular control characteristics for a variety of machines. The machine tool industry has adopted tracer controls for many machines, and as automation becomes more universal, tracer controlled machines will become commonplace.

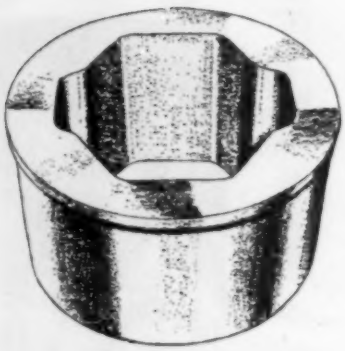
One of Rockford Machine Tool Company's most recent applications of tracer control is on a slotter for machining variable internal contours. A standard slotter is equipped with power feed and traverse in three directions: longitudinal, cross, and rotary. The tracer valve has been applied to either the longitudinal or cross movement. On the specific machine described in this article, the tracing is done on the cross movement. The conventional cross feed screw is replaced by a cylinder, which is controlled by the tracer valve. The standard rotary increment feed is employed, and as the feed progresses, the tracer valve controls the position

EARLE W. JOHNSON, *Chief Development Engineer,* STANLEY A. BJORKLUND, *Hydraulic Design Engineer, Rockford Machine Tool Co., Rockford, Ill.*



2. HAND MADE MASTER FORM

3. DEVELOPED CAM



4. FINISHED WORK PIECE

of the work from a cam located on the master fixture.

MAKING THE CAM

Since a tracer controlled machine must be flexible to handle a variety of work, it is desirable that an economical method of producing cams be available. Unlike the cams used with most other tracer controlled equipment, the master cams used on slotters are not exact duplicates of the work piece. Since the tracer valve stylus bears on the periphery of the cam, which is larger than the work, the cam must be developed. Thus, the radial dimensional changes of the cam are identical to the work piece, but its contour changes because of its greater diameter. To produce such cams from drawings on conventional cam cutting equipment is an expensive job. For this reason the tracer circuit was designed in such a manner that it could be reversed. We can now produce master cams directly on the machine from a finished work piece or a hand made master contour.

SEQUENCE OF PRODUCTION

The sequence used to put a typical part in production is shown on Figures 2, 3 and 4. Figure 2 represents a hand made master, built to the exact contour required on the finished work piece. Figure 3 illustrates the developed cam made directly on the machine from the master contour. This cam is cut with the machine arranged for cam cutting as shown in Figure 5. Figure 4 illustrates the finished work piece which will be run in normal production, in-

5. MACHINING THE CAM is done by placing a master form in the normal work piece position. The tracer valve follows the form contour to control the cross movement of the single point slotter tool which is cutting the cam.

terchangeably with other parts having a variable internal contour.

Once the cams have been made they can be used indefinitely for production. The location of cam and work piece are synchronized on a master fixture so that they can be quickly and positively exchanged.

DESIGNED FOR SAFETY AND ACCURACY

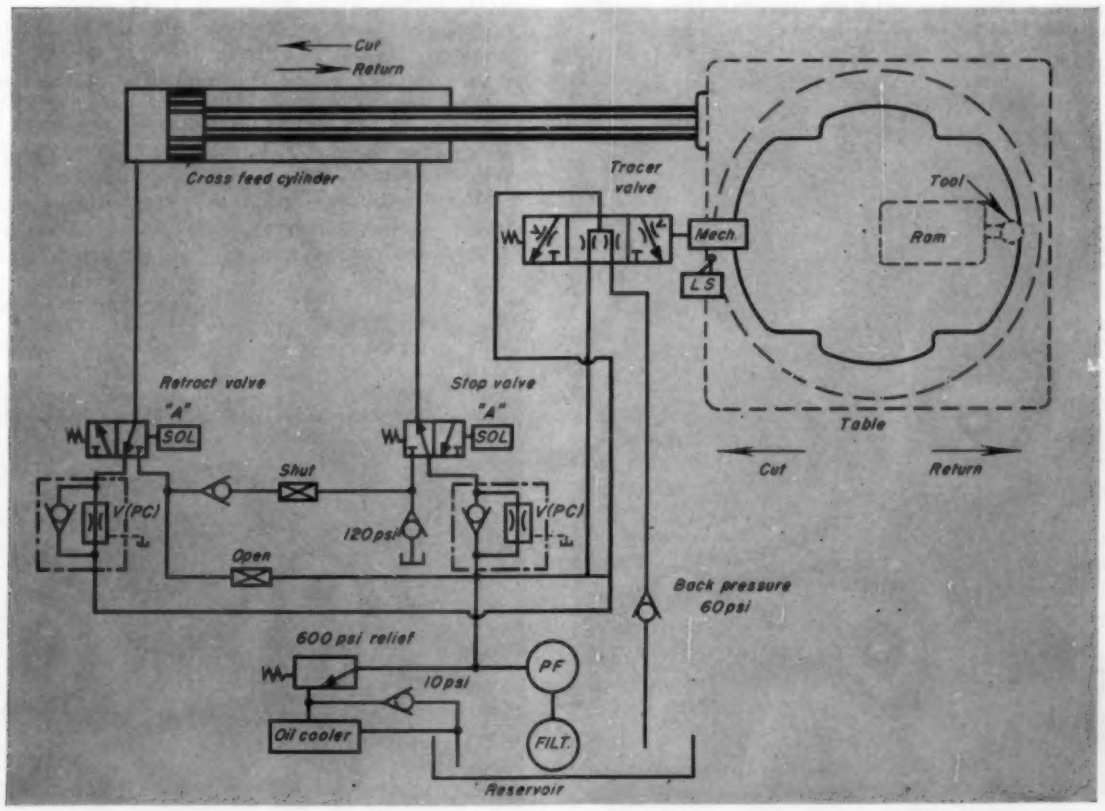
Many valuable features have been designed into the equipment to make it trouble-free and accurate. Both the cam cutting and work cutting tools have been designed for positive location and easy interchangeability. They can be set by the tool grinder, eliminating any error on the part of the operator. The electrical circuit is positively interlocked with the tracer hydraulic system for accuracy and safety. The entire table assembly retracts automatically on the return stroke of the machine. This retract serves the dual purpose of tool relief and positive repositioning of the stylus; thus assuring accuracy on even a very minute change in contour. Safety protection is provided for power failure to prevent damage to work or machine. In the event of power failure or inadvertent motor shut off, the work automatically retracts from the tool preventing breakage. This is accomplished by means of a normally energized solenoid operated retract valve controlled by a pressure switch in the main circuit of the machine. The hydraulic circuits of the tracer system and machine are entirely separate, thus preventing any surge of the machine hydraulic system from affecting the accuracy of the tracer. Oil temperature, and therefore viscosity, are automatically controlled at optimum level. Ram saddle ways are hardened and ground, and both have automatic pressure lubrication.

HYDRAULIC CIRCUIT FOR WORK CUTTING

When the slotter ram is up, a pressure switch is actuated to deenergize solenoid stop valve. Hydraulic fluid is then directed from the pump through stop valve to the rod end of the table positioning cylinder. Pump oil is also directed to the pres-

Continued on page 114

6. CROSS FEED CONTROL for machining the work piece is obtained with this tracer circuit. Valving is shown in positions taken during the cutting stroke. The tracer valve is in the shut-off position so that there is no cross feed. Retract valve is energized and stop valve is deenergized. When the cut is completed, retract valve is deenergized. Oil pressure now acting on the large back area causes table retraction. At the end of the retract stroke, both valves are energized to open both cylinder ends to tank and stop the retraction. When the slotter ram is raised, cross feed is initiated by pressure switch action which deenergizes solenoid of stop valve, reestablishing tracer control.



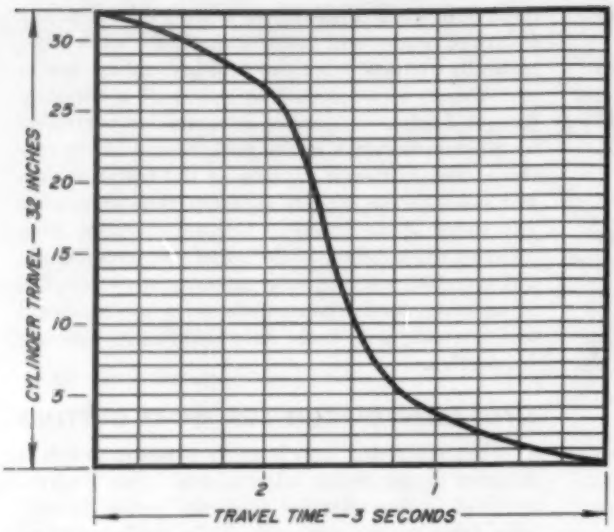


FIG. 1. MOTION CURVE for a 32 inch stroke cylinder shows the control of acceleration and deceleration which is obtained by use of a specially designed cam operated 2-way valve.

ACCELERATION

● By Donald L. Kingston

CONTROL of hydraulic motion at the start and at the end of cylinder travel is often difficult on long stroke operations where smooth action is necessary. To solve this control problem on one of our hydraulically driven machines, which makes circular shaped glass tubes, we developed a special acceleration-deceleration valve. A cylinder having a 32 inch stroke is used on this machine. Our final speed control system resulted in a motion which follows the modified har-

DONALD L. KINGSTON, *Design Specialist, Sylvania Electric Products, Inc., Salem, Mass.*

FIG. 2. ROLLER FOLLOWER on the 2-way valve rides against a plate cam which positions the valve spool to regulate flow of oil to the hydraulic cylinder.

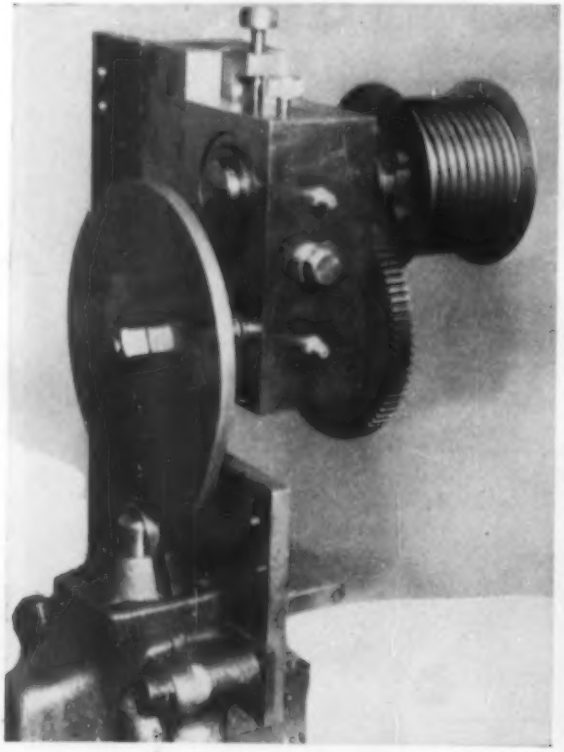
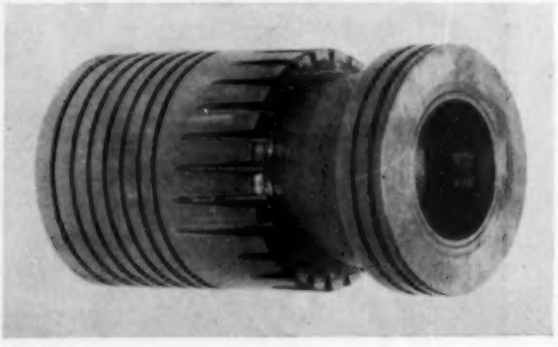


FIG. 3. UNIQUE FEATURE of the spool used in the 2-way valve is the grooves. Around the spool periphery, 24 "V" grooves of varying length are cut.



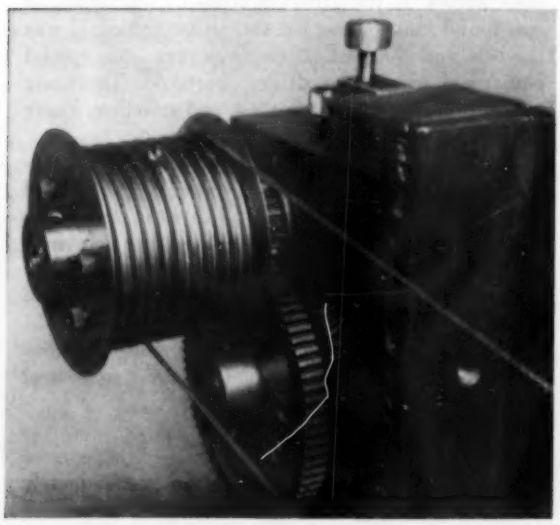
CONTROL DEVICE

. . . for hydraulically powered motions

monic curve as shown in Figure 1. This curve clearly indicates the acceleration and deceleration pattern during the three second travel time. The speed control arrangement, illustrated in Figure 2 can be varied to give different speed characteristics.

On the circular glass tube making machine, the glass, in a semi-plastic state, must be handled as quickly as possible and yet very gently. During the three second travel, the cylinder moves at an average rate exceeding 50 feet per minute. Acceleration and deceleration is regulated by a cam operated 2-way valve which has a special spool as shown in Figure 3.

To produce this valve, a standard 2-way valve, capable of handling 11 gpm at 1500 psi was purchased. The new valve spool was specially designed and made by our tool makers. This valve spool has 24 "V" shaped grooves cut at an angle to the spool surface. Starting with a groove approximately 9/16 inch long, each successive groove is made 1/64 inch shorter so that the final groove has a length of 3/16 inches. To make all the "V" grooves end at the same depth, each groove is cut at an angle which is 30 minutes less than the preceding angle. This spool design gives a much smoother action than is obtained from the conventional tapered or straight type spool.



CAM VARIES SPOOL POSITION

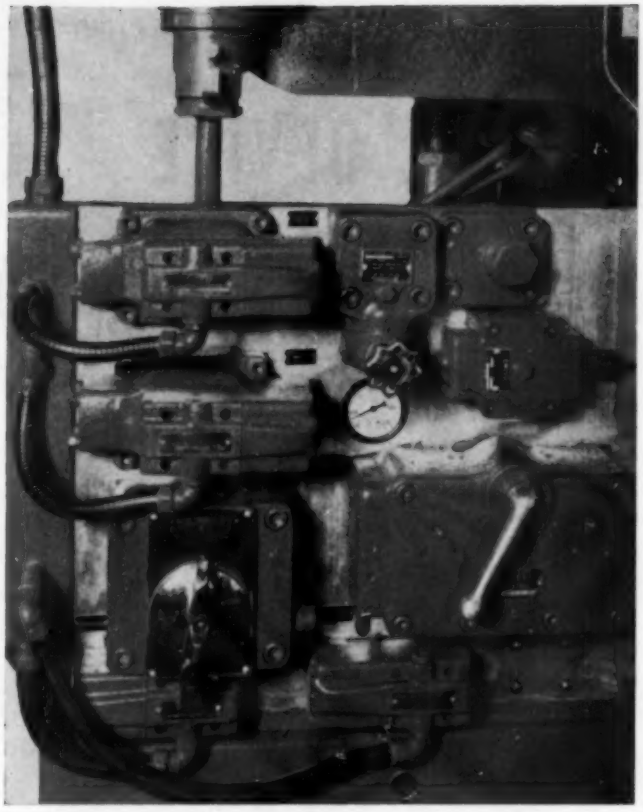
Position of the valve spool is controlled by the action of the plate cam which rides against the valve cam follower. The acceleration-deceleration pattern is determined by and can be varied by changing the contour of the plate cam. The driving power for the valve operating mechanism is taken directly from the cylinder or that portion of the machine attached to the cylinder. The method of transmitting the power to the valve mechanism can be done by a cable and reel or by a rack and gear. Figure 4 shows the use of a cable and reel to drive the plate cam. The cable is connected to the table and passes over a "V" groove pulley at some stationary point beyond all table movement. The other end of the cable is wound around the reel and securely fastened. The diameter is such that for four revolutions, it will rotate a pinion and gear at a 4 to 1 ratio, thus giving the cam one revolution.

Where it is impossible to provide the necessary speed control at the ends of cylinder travel by means of built-in cushions or with standard deceleration valves, this acceleration method can be used advantageously.

▼▼▼

FIG. 4. POWER TO DRIVE the plate cam is supplied by the hydraulic cylinder which pulls a cable seen wrapped around the reel. The gear reduction results in one revolution of the plate cam for four revolutions of the reel.

DRILLED HYDRAULIC MANIFOLDS



1. *VALVES ON A HONING* machine are all gasket mounted on a drilled type manifold which results in . . .

• By Jack Eau Claire

TO the maintenance and service men, accessibility of hydraulic components is of major importance. Since the start of the Joint Industry Conference (JIC), much unnecessary work for the maintenance of machines has been eliminated. One of the many features that have been accomplished was to gasket mount control valves. This has brought about the hydraulic manifold.

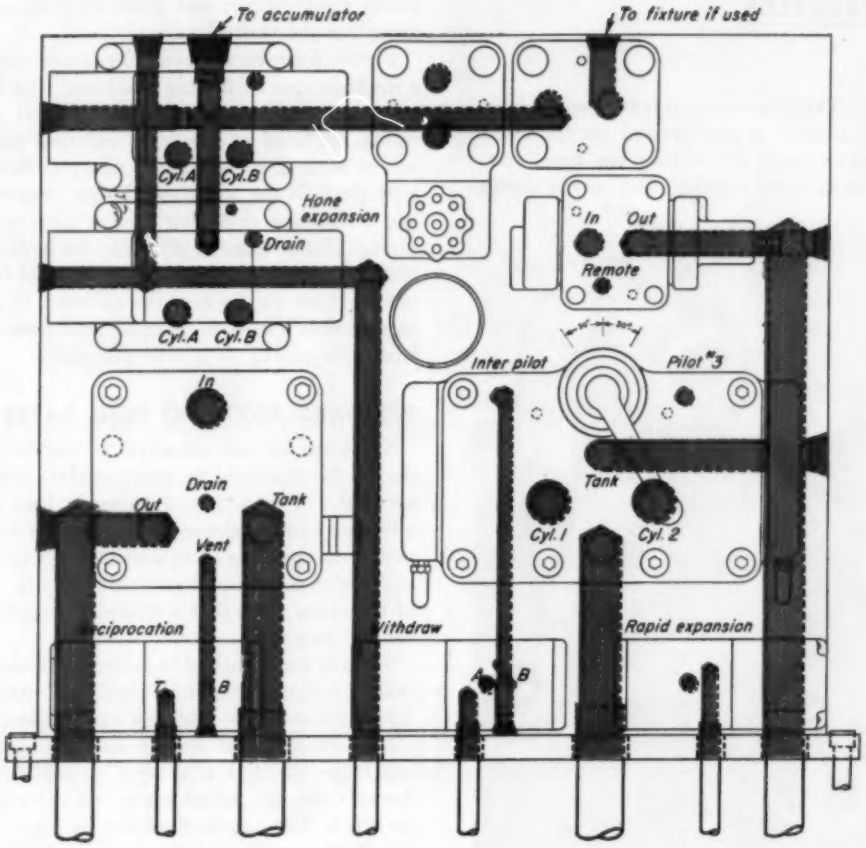
There are many types of hydraulic manifolds in use today, such as a sandwich type manifold, the brazed manifold, and the drilled type manifold.

JACK EAU CLAIRE, *was Hydraulic Engineer with Barnes Drill Co. of Rockford when he wrote this article. He recently joined J. M. Grimstad Company as Sales Engineer.*

Considerable experimental work was done in the early stages on the different types of manifolds. It was found that for our use the drilled manifold was the best and cheapest. It requires very little special equipment to make a drilled manifold. The basic operations are drilling, tapping, and grinding. There is very little more that need be done.

The hydraulic manifold eliminates a lot of unnecessary piping. This means fewer hydraulic oil leaks. Through experiment it has been found by using a pipe plug with $\frac{7}{8}$ inch taper per foot in a tapped hole with $\frac{3}{4}$ inch taper per foot that many hydraulic leaks have been eliminated. It should also be noted that when the drilled hydraulic manifold is made of aluminum, the pipe plug should be aluminum. A steel pipe plug should be used in a steel manifold.

There are many arrangements of control valves that can be put on a drilled manifold. With careful engineering almost every circuit can be completely put on one manifold. Sometimes it may be found



. . . *LESS EXTERNAL PIPING* **between valves. Drilled passages in the plate do all the interconnecting between the valves. External piping from the manifold goes to the machine.**

necessary to use an external pipe or two to give a good valve arrangement.

When there is a standard circuit that is used frequently, it is advisable to make a manifold. This eliminates much special piping which tends to make every circuit a hand-made job. The drilled hydraulic manifold makes a machine look much nicer, but what is more important, it makes the valves much more accessible in case of a breakdown. When making more than one drilled manifold, it is advisable to make a drilling template. This saves set-up time required in drilling a new manifold.

ALUMINUM MANIFOLDS ARE CHEAPER

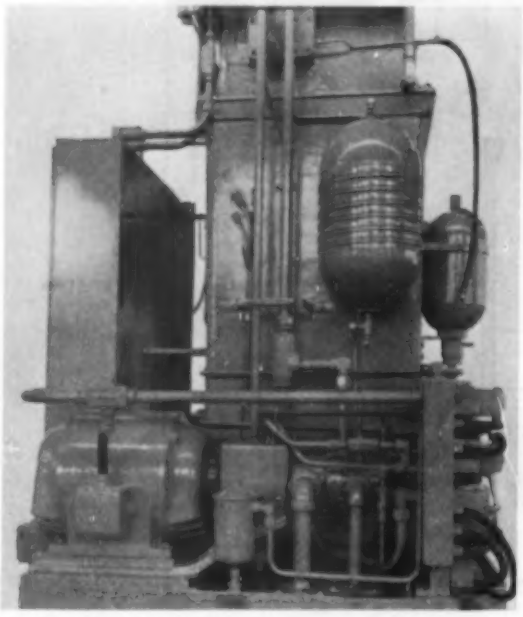
The drilled manifold in many cases is made of 2 inch thick aluminum or steel. We have found that the aluminum manifold is much better to use because it is much cheaper to drill and handle, and there is less chance of drill breakage in aluminum. If the circuit is of a very large capacity, thicker manifolds are necessary. Under actual running conditions it has been found that it is possible to run 45 gpm through the porting on a 2 inch thick manifold without too much pressure drop.

Care must be taken, in laying out the valve arrangement on a drilled manifold. Drilled holes running parallel or across one another should not be closer together than ¼ inch.

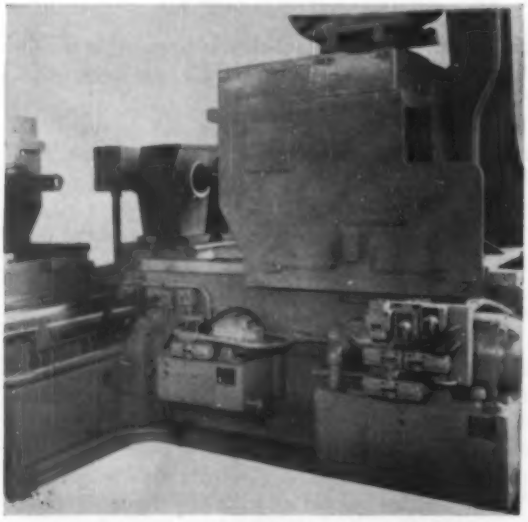
The tapped holes for hold-down bolts of the control valves should not break through into pressure or tank return lines. A pipe tap of 1¼ inch can be used on the cross-sectional thickness of a 2 inch thick manifold. Under actual conditions, 1¼ inch fittings were checked and no leakage occurred at 1200 psi which was the highest pressure setting checked. Care should be taken in drilling holes with long depth. Wherever possible a hole should be drilled from two sides to eliminate drill wandering. This is another reason why the aluminum manifold is much better; there is less chance of a drill wandering than in steel manifolds. Long fluted drills are best suited for drilling deep holes.

It is advisable to taper ream all pipe tapped holes

before tapping. This gives a much better tapped hole. The drilled manifold is not ground on the valve mounting surface until all drilling has been completed. This eliminates burring and any warping which might occur, and gives an even surface for mounting the control valves.



2. *ANOTHER VIEW* of the manifold and piping on the honing machine shows the piping from the manifold to the hydraulic cylinder. The pipes lead into another manifold on the back of the column.



3. *DOUBLE END HORIZONTAL BORING* and facing machine has manifold mounted valves which provide two feed rates. The smaller hydraulic pump and tank unit powers the index table.

Figure 1 shows the control valve arrangement of a multiple spindle honing machine. This is a standard hydraulic manifold having internal pipe plugs which are used to eliminate external piping. This can be done in steps using as many as three internal pipe plugs if the manifold design requires it. Figure 2 shows a side view of the manifold and the piping. Notice that the piping to the hydraulic cylinder comes from the hydraulic manifold to a piping manifold on the back of the column. This arrangement makes it easy to assemble and disassemble the hydraulic piping as a unit assembly.

DESIGNED FOR TWO FEED RATES

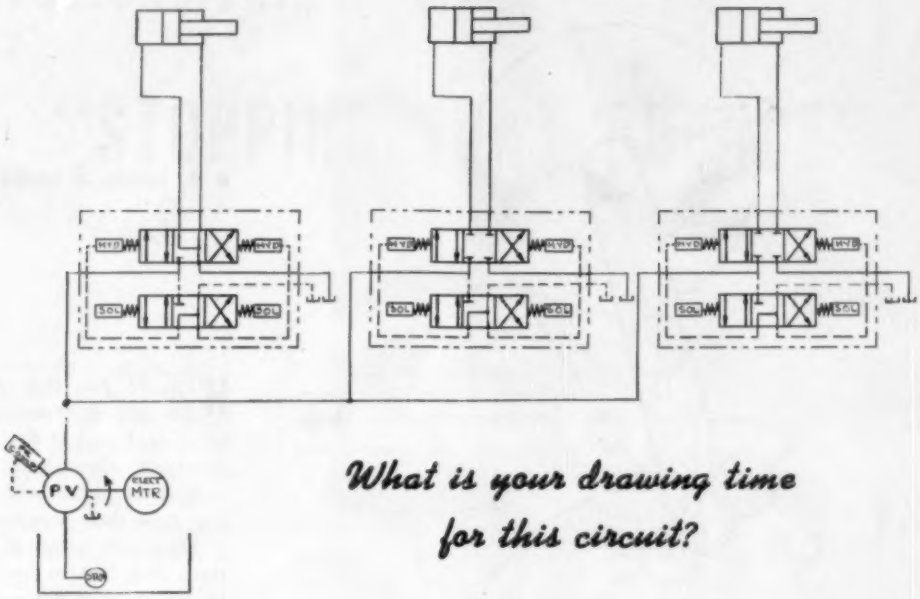
On some of our standard production units, we design the manifold to accommodate either one or two rates of feed. It can be made into one or the other or can be changed over in the field with a minor change. The extra cost in the original tooling and design has more than paid for itself. This is one of the many ways that a drilled hydraulic manifold can be designed.

Usually the manifold is mounted on the hydraulic tank and piped to the individual unit which it serves. When the machine has one rate of feed, block-off plates are mounted on the manifold. These plates are taken off and a volume control valve and a 4-way valve are added when two rates of feed are required. The machine shown in Figure 3 uses a manifold providing two rates of feed. These are some of the many features that can be accomplished by good drilled hydraulic manifold design. On the manifold drawing, we put all the control valve model numbers along with the piping instructions.

There are many ways of mounting drilled hydraulic manifolds and there is very little limit to the size of the drilled hydraulic manifold or to the arrangement of the control valves. The only limit would be in the designer's estimate of what would constitute good design.

Where there are solenoid operated control valves, it is advisable to mark their function on the layout drawing. This helps the person who has to pipe up the machine and also the electricians who have to wire it. It has been found very useful to make a little tag and fasten it on the manifold next to the proper solenoid. This eliminates any possible guess work by a person looking at the manifold trying to find a certain valve.

The photographs show a junction box fastened to the side of the drilled hydraulic manifold. This makes for an easy and nice appearing wiring job. The junction box can be made of cast iron, cast aluminum, or welded steel. Cast aluminum boxes have been found to be very easy to handle and drill. A sheet steel cover is made to cover up the wiring and is put in place after the wiring has been completed. The junction box can be mounted on either side of the manifold or on top. ▼▼▼



What is your drawing time for this circuit?

HOW TO REDUCE BOARD TIME

. . . for JIC air and oil circuits

EVEN if you are familiar with JIC symbols and procedures, the circuit shown here would take almost an hour to draw. Using a recently developed drawing kit, this circuit was completed in less than 15 minutes. The kit has a set of 8½ x 11 inch master symbol sheets on which are printed all the basic symbols, such as, the valve, cylinders and pump-motor unit used in our circuit.

There are strips of adhesive on the back of the symbol sheet, so that when individual symbols are cut from the sheet, each symbol has adhesive along two edges. Individual symbols are cut from the sheet with a pair of scissors and placed in position on the layout sheet. To simplify the layout, a grid sheet of vertical and horizontal lines on one half inch centers, was placed under the tracing paper layout sheet. These grid lines were used to line up the preprinted symbols on the layout.

The master sheet contains basic symbols which can be completed very simply to suit requirements. For example, completion of the basic solenoid valve symbol requires that some directional arrows for flow characteristics be added. Also the pilot supply and drain must be added to show whether they are external or internal connections.

For more complex circuits, the kit proves of even greater value. Symbols can be readily moved around on the layout sheet until the best arrangement is obtained.

This new drawing kit includes a circuit checking method. Directional valve porting spools and cylinder pistons are printed on a card. When cut from the card they become slides which fit over valves or cylinders on the layout. Transparent windows with adhesive are placed over the slides to hold them on the sheet. It is possible to shift the valve and cylinder slides on the layout sheet to show the complete circuit through all valve and cylinder positions.

Very often a circuit having a number of valves is difficult to visualize and check. It is sometimes necessary to make several drawings to show various circuit conditions. The new method provides an easy way to see any valve in any position and eliminates the need for visualizing some valves in one position while mentally shifting others.

Use of the kit takes very little practice; it eliminates the tedious, time consuming, and often repetitious job of drawing symbols. ▼▼▼

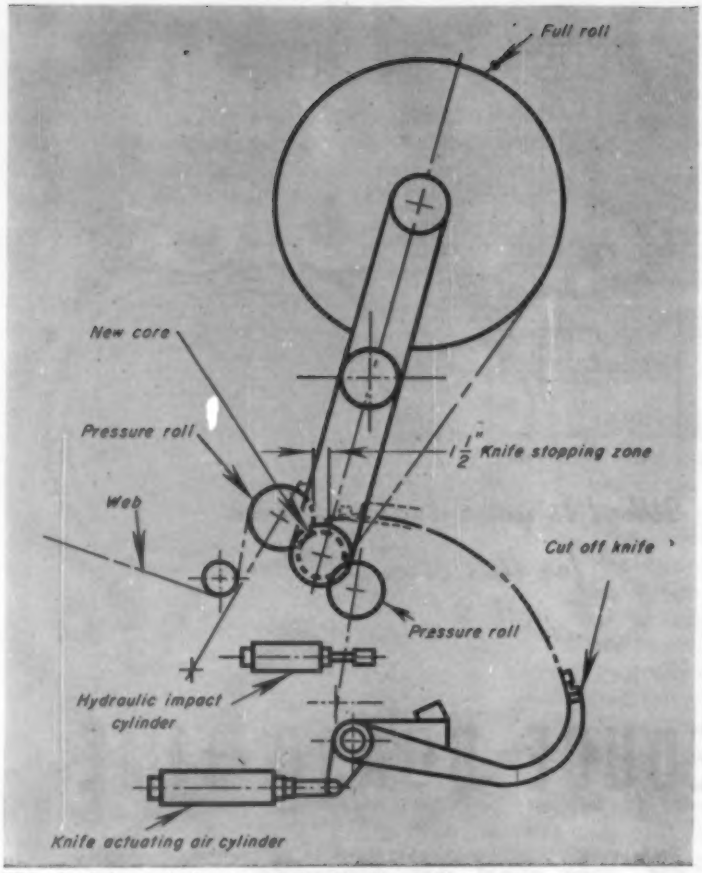


FIG. 1. Schematic layout of the plastic winder.

• By James J. Melead

HOW do you stop a force of ten tons on an automatic plastic winder and at the same time eliminate the elastic bounce? Can it be done within 1-½"? Can it be done repeatedly?

These are some of the questions that had to be considered in designing an automatic plastic winder for the Monsanto Chemical Company at Springfield, Massachusetts.

The winder is a two arm rotatable reel for continuous center winding of plastic sheeting. Uni-

JAMES J. MELEAD, *Project Engineer, Dilts Machine Works Division, The Black-Clawson Co., Inc., Fulton, N.Y.*

Fundamental Mechanics Determines Impact Force

• Some assumptions have been made to simplify the calculations

KNIFE ACCELERATION

A = Cylinder area = inches² (2 cylinders)
P = Air pressure = psi
F = Air cylinder force = lbs.
L = Air cylinder torque arm = in.
M = Moment created by air cylinders = in lbs.
W = Weight concentrated at tip of knife arms = lbs.
r = Knife arm length = ft.
g = Gravitational constant
α = Angular acceleration (rad /sec²)
a = Linear acceleration = ft/sec²
I = Moment of Inertia = lb. ft. sec.²

$F = P \times A$

$M = F \times L$

$I = \frac{Wr^2}{g}$

$M = Ia$

$a = r\alpha$

$a = 200$ ft/sec²

KNIFE VELOCITY

V max = Velocity at point of impact = ft/sec
V_o = Initial velocity = 0
S = Knife travel = ft.
T = Time = sec.
V avg = Average velocity

$$V_{avg} = \frac{V_{max} + V_o}{2}$$

$$T = \frac{S}{V_{avg}} = \frac{2S}{V_{max}}$$

$$V_{max} = V_o + aT$$

$$V_{max} = a \times \frac{2S}{V_{max}}$$

$V^2_{max} = 2aS$

V max = 2000 FPM

KNIFE IMPACT

K. E. = Kinetic energy = ft. lb.
P max = Impact force = lb.
D = Stopping distance = 1½ in.
P avg = Average impact force

$$KE = \frac{W V^2_{max}}{2g} = P_{avg} \times D = \frac{P_{max} \times D}{2}$$

P max = 20,000 lbs. — total
P max = 10,000 lbs/cylinder (1500 psi on a 2" cylinder)

Considerations for...

"STOPPING THAT BOUNCE"

form and even starts are obtained without the use of adhesives or special cores. There is no loss of tension at roll change. The operator removes the full roll and inserts a fresh core—all other action is automatic. A schematic arrangement of the winder is shown in Figure 1.

AIR ACTUATES KNIFE

In order to obtain uniform and even starts an electrically heated knife actuated by dual air cylinders must accelerate from a rest position at 200 feet per second^2 and obtain a velocity of 2000 feet per minute (about 25 miles per hour) and do all this within a distance of less than one yard. At the point of severing the web, the knife must lay the plastic sheeting down on the core evenly without foldback, wrinkles, or loss of tension.

We knew the perfect starts could be accomplished if a means could be devised to stop this high speed knife immediately after severing the web—without bounce—within 1-½ in of travel.

Stopping the bounce was necessary so that the plastic sheeting would not get picked up by the knife and be wrinkled or folded back giving imperfect starts on the fresh core.

This plastic sheeting is very delicate and any foldback or wrinkle would be transferred to the successive layers and thereby completely ruin many yards of this expensive material.

Many conventional and radical methods were considered to stop the bounce but had to be discarded as either too costly, too complicated, not capable of repeatedly withstanding the punishment, occupying too large a space, or inability to reset itself.

The problem was solved by using two small bore hydraulic cylinders with large diameter rods in conjunction with a bladder type air-oil accumulator and needle valve, as shown schematically in Figure 2.

The accumulator and cylinders are filled with oil and the accumulator bladder is charged with 100 psi air thus loading the entire system with 100 psi pressure to take the impact and provide the resetting pressure.

OIL ABSORBS IMPACT

When the knife with a force at point of impact of 20,000 lbs strikes the two hydraulic cylinders, the energy is expended through the orificing of the oil through the needle valve to the accumulator and the shock is absorbed within the 1-½" stroke of the cylinders.

When the stroke ends and the knife is returned to its initial position, the opening in the orifice is sufficient to allow the pressure built up in the accumulator to force the oil and thus the cylinder to come slowly forward again, returning the piston to its position before impact.

The instantaneous impact pressure built up in the hydraulic cylinders is 1500 psi. Of course small bore hydraulic cylinders are used to keep to a minimum the quantity of oil that requires transfer in the 1-½" stroke of the cylinders and also for space considerations.

If this impact problem had not been solved, it would have completely defeated the operation of our automatic winder. ▼▼▼

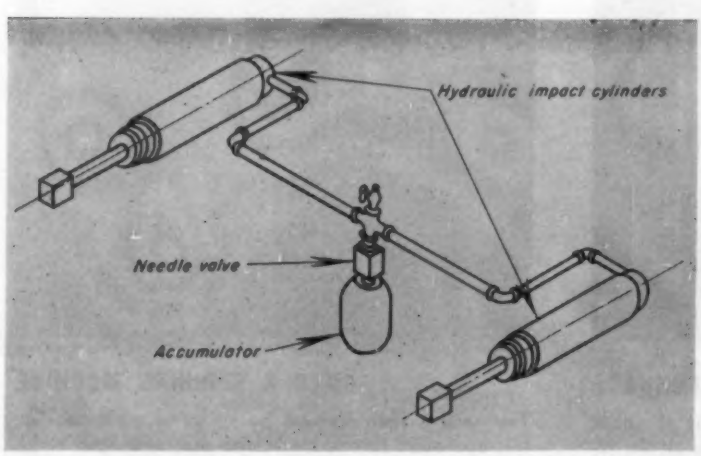


FIG. 2. This simple hydraulic setup successfully stops a force of ten tons and eliminates the elastic bounce.

FORMING, SPINNING, BANDING

of high pressure bottles

STARTING WITH THE BLANKS

Cylinder making starts when circular blanks of heavy gauge steel are delivered to the press room. Here are thousands of future cylinders awaiting the first step in their processing. Most industrial cylinders are chrome molybdenum steel.

HEAVY forces needed for the production of cylinders to be used for gas storage and pressure bottles, fire extinguishers and air and hydraulic accumulators are developed by hydraulic deep draw presses and spinning machines. At Walter Kidde & Company, Inc. about 200,000 cylinders of all types and sizes will be produced this year. Approximate size range of these cylinders is from 2 to 8 inches in diameter and 5 to 25 inches in length.

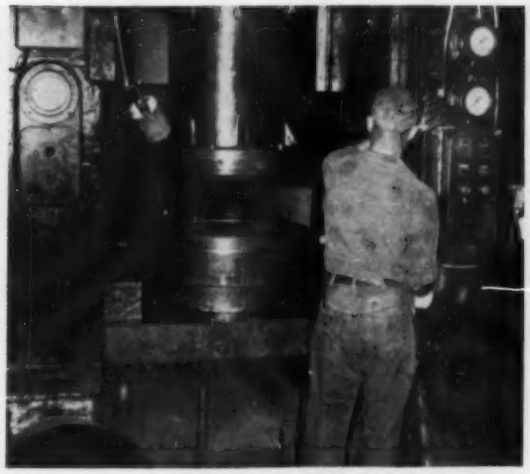
While the greatest number of cylinders end up as fire extinguishers, many of them become a part of

INTO AN INDUCTION FURNACE

In order to form a neck on the tube, heat at about 2200°F is applied to its open end through an induction process and the tube is removed from the induction heater with the neck white hot. The part is rolled on a conveyor into the spinning machine.

ONTO A SPINNING MACHINE

The neck is then formed by spinning machines like this hydraulic turret. Here, the operator spin forms the white hot neck of the cylinder by operating the manual hydraulic control valves from behind a protective screen. Oil pressure does the spinning.

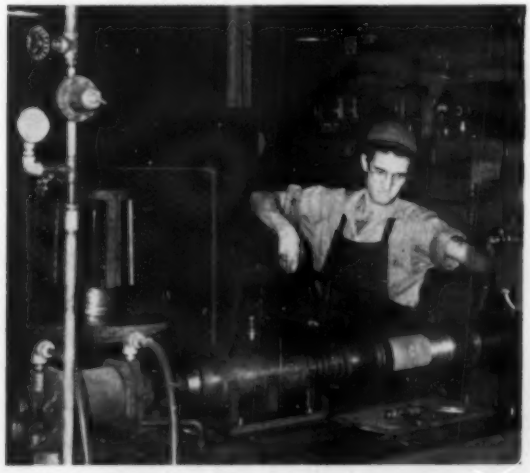


HYDRAULIC CUPPING PRESS

"Cupping" is the first step in changing the shape of the blank. The pressman is about to close the hydraulic press. Under 600 ton pressure, the 25 foot high press will transform the blank into a shape similar to that of an overgrown soup bowl.

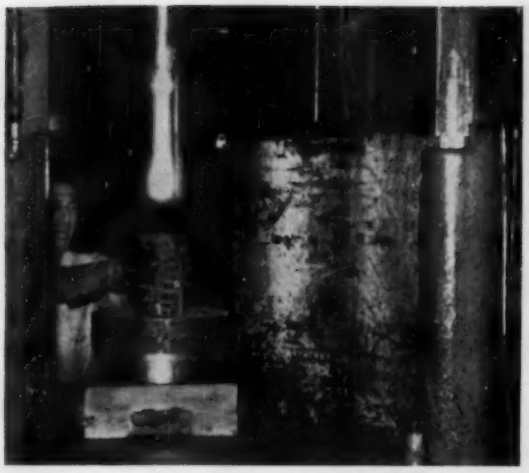
the high pressure pneumatic systems in aircraft. Production includes about 135 different kinds of cylinders which vary in size, material and pressure ratings.

Chrome molybdenum steel is used for most of the industrial cylinder line. While the cylinder wall becomes thicker as the pressure rating increases, most of them are pressure approved with a service rating of 1800 to 2100 psi. The burst pressures are over 5000 psi. For pneumatic bottles used on aircraft, working pressure goes up to 3000 psi. ▼▼▼



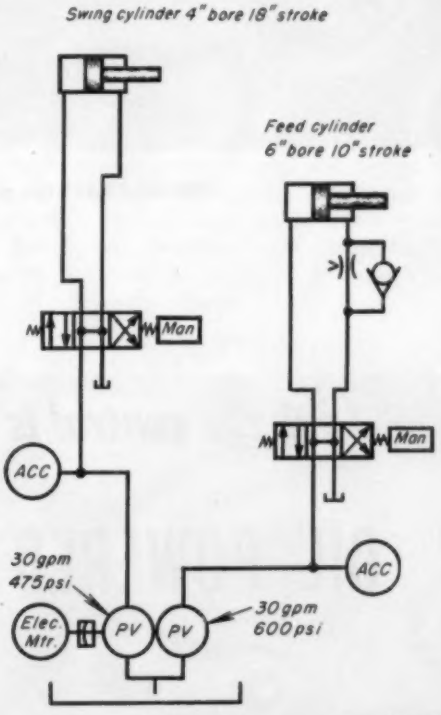
SOME ARE WIRE BOUND

Cylinders which will be subjected to gun fire on military aircraft where the cylinder could be ruptured by bullets in combat are bound with piano wire to make them as shatterproof as possible. Air at 40 to 90 psi holds the cylinder.



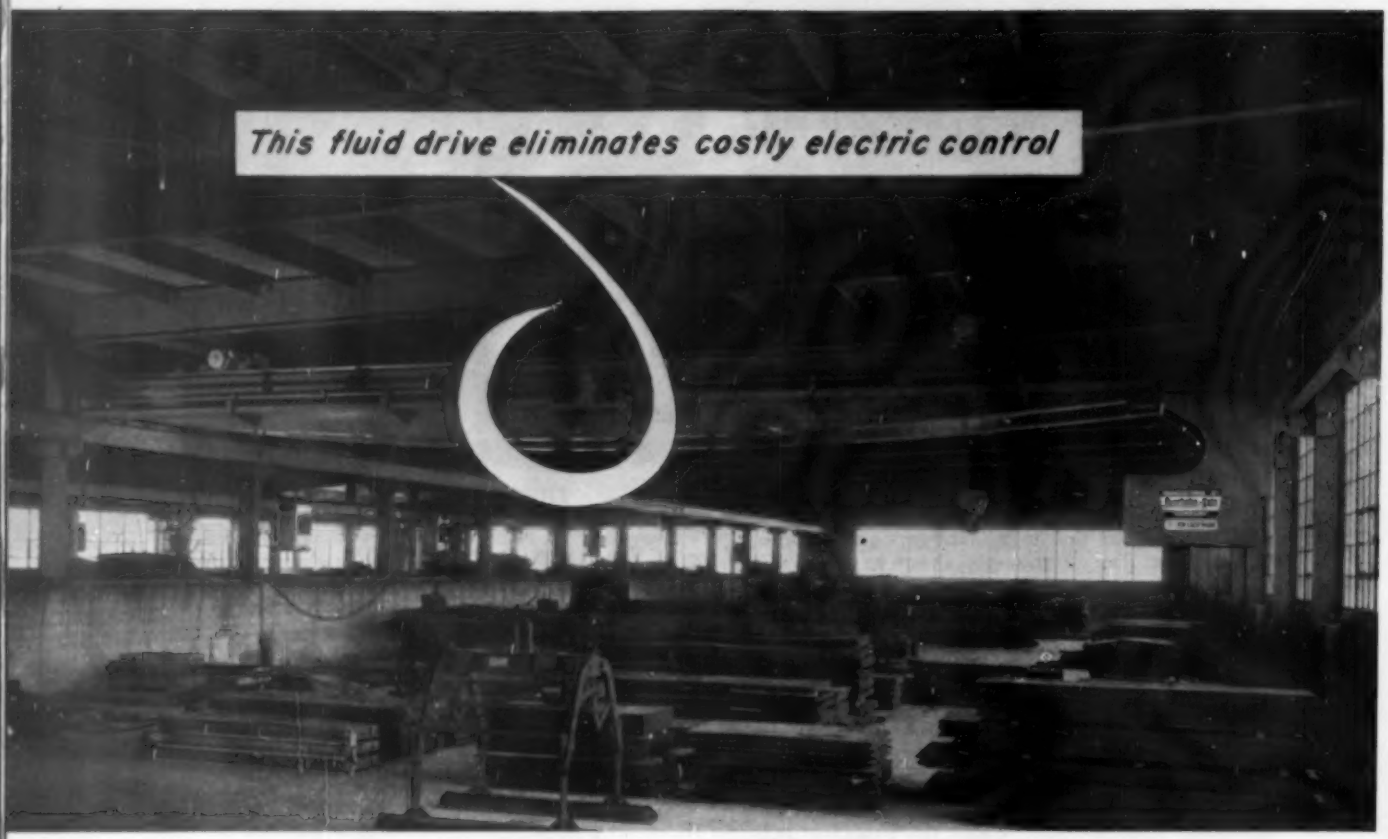
THROUGH A SERIES OF DRAWS

By means of a series of drawing operations on a score of hydraulic presses the "soup bowl" is transformed into a cylindrical tube, closed at the bottom and open at the top. Here the tube is being "stretched" by a 300 ton, single action press.



SPINNING MACHINE CIRCUIT

Each of the pumps powers a circuit. The 600 psi pump supplies the feed cylinder; the 475 psi pump supplies the swing cylinder. Manually controlled 4-way valves are spring centered and provide forward, reverse and stop action of the cylinders. Meter-out control on the feed cylinder provides an adjustable feed rate of about 200-300 ipm. A spinning force of more than 8 tons is developed. The accumulators are each 1 gallon capacity and are in the circuit to absorb shock.



BRIDGE TRAVEL is powered by a 15 hp hydraulic system.

Leakage control is a "must" for a successful

OIL POWERED OVERHEAD CRANE

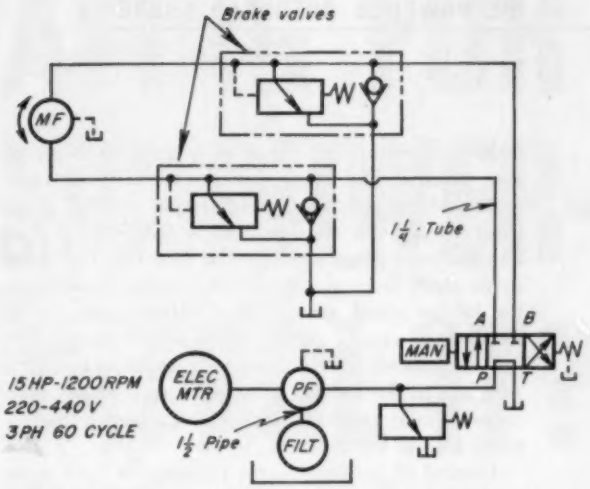
Crane speed is 300 fpm—and the hydraulic system moves right along with it. With the hydraulic system moving 15 feet above workers, material and machines, a leak of any size means trouble. Piping of this circuit takes on great importance. Successful use of this drive opens new possibilities for hydraulics on shop cranes.

UNTIL recently all overhead cranes were built with an AC or DC electrical drive to move the bridge, the trolleys and the hoists. Could these movements be powered hydraulically? If so, would hydraulics pay? To the engineers at Overbeke-Kain Company in Cleveland, powering the bridge hydraulically certainly seemed feasible and offered many advantages over the electric drive. When the advantages of this drive with its lower initial and maintenance costs were pointed out to one of their customers, he agreed to purchase what would be considered a very unconventional crane. The completed crane has now been in operation for a year. Its service record is excellent and there has been no maintenance required for the hydraulic drive.

The hydraulic system is a simple manually controlled fixed displacement pump and fluid motor drive. Operating at 1000 psi, the system provides smooth positive acceleration and deceleration. Hydraulic power starts, positions and stops the bridge as quickly, as accurately and as smoothly as any electric drive. The advantages of oil power over an electric drive are readily apparent on this application. A costly brake and an expensive wound rotor, variable speed motor and necessary electric controls are no longer required. The entire construction of the drive is simplified.

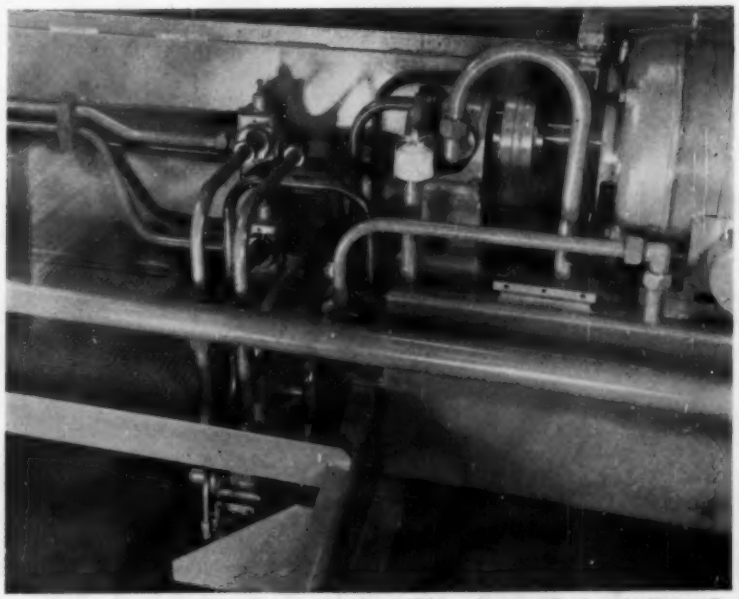
ELIMINATES SUPPORTING TRUSS

Often, on an electrically powered bridge, an additional truss is required to support the eccentric loading of the drive motor and gear box. On the hydraulic drive, the hydraulic pump, electric motor and tank are mounted off at one end of the drive shaft and only the small fluid motor and gear reducer mount at the centerline of the crane.



COMPLETE CONTROL of bridge motion is obtained by use of the three position 4-way valve. A special spool in this valve throttles the oil for acceleration as the control lever is moved.

The crane built by Overbeke-Kain has two trolleys. Each will handle up to a 7½ ton load. The crane weighs about 25 tons. This means, fully loaded, the hydraulic power moving the bridge must start and stop about 40 tons. The other requirement to be met by the hydraulic system was a speed of 300 fpm. It was determined that 11 hp would be required at the bridge wheels. A 15 hp polyphase



ALL VALVES and the power package are rigidly mounted at the side of the crane above the cab. Use of tubing and flared fittings has resulted in a leak-proof system.

Photo Courtesy Parker Appliance Co.

induction motor driving a 33.5 gpm vane pump was selected. The pump delivers its oil to a vane motor which will develop 1250 rpm at 33.5 gpm. Power from the fluid motor is fed into a gear box having a speed reduction of 14.6 : 1. The main drive shaft from the gear box couples directly to the bridge wheel axles. This eliminates gearing at the bridge wheels.

It is important that there be very little backlash of gears in the reducer as a quick stop of the fluid motor would result in severe shock and excessive tooth load in the reducer.

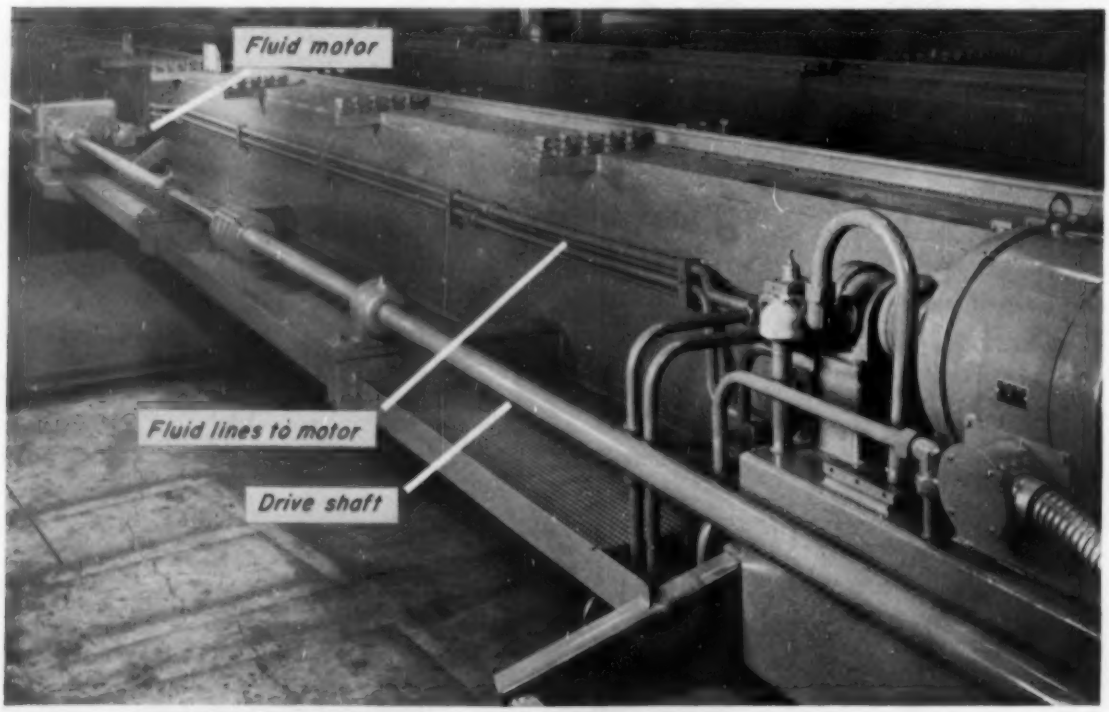
Control of the fluid motor is provided by a three position, 4-way valve having cylinder ports blocked in neutral. Acceleration and deceleration control is obtained as the operator moves the valve control lever. This lever which hangs down into the operator's cab is three feet long. Lever movement at the operator's hand results in very small movement of the tapered valve spool which provides throttling of the oil flow to the fluid motor. A brake valve (relief) and check valve are in each line to the fluid motor. When the 4-way control valve is centered, the motor stops. Spring centering of the control valve provides a simple safety device to assure stopping when the handle is released.

If this drive is so simple and provides comparable operation to an electric drive at lower initial cost, why hasn't hydraulics been applied to overhead cranes before? Perhaps the main reason has been reliability. An overhead crane is a production tool. Its failure could result in a bad tie up of production. Consequently, possibility of failure has to be minimized. While the drive requirements are simple and can be readily met with oil power, the service is severe and very little leakage can be tolerated. Leakage on a moving crane would be hazardous. This leakage control problem on the crane was solved by using flared, three piece tube fittings. Use of tubing kept joints to a minimum. All valving is mounted close to the reservoir. The two main 1¼ inch fluid carrier lines to the motor and the small ¼ inch drain line from the motor back to tank are rigidly mounted to a bridge girder.

Another problem connected with the hydraulic drive is the splashing of oil in the tank as it moves with the bridge. This splashing has resulted in aeration of the oil which has been the cause of some pump noise.

NEW DESIGN IN THE FUTURE

With proven reliability for hydraulic drives on overhead cranes, what might future designs include? R. E. Overbeke, president of Overbeke-Kain, believes that the next step might be individual fluid motor drives at each of the bridge wheels, thereby eliminating the long drive shaft. Perhaps, hydraulically powered trolleys may also prove to be practical. ▼▼▼

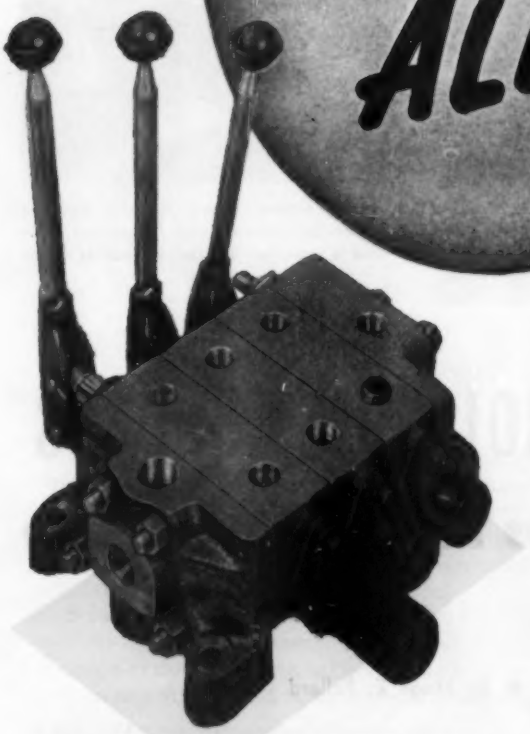


POWER is transmitted to the driveshaft by the fluid motor driven gear box.

YOU'RE PAYING FOR OIL HYDRAULIC POWER- WHY NOT CONTROL IT?

ALL NEW!

MULTIPLE UNIT HEAVY DUTY DIRECTIONAL VALVE for finest precision operation of mobile and materials handling equipment



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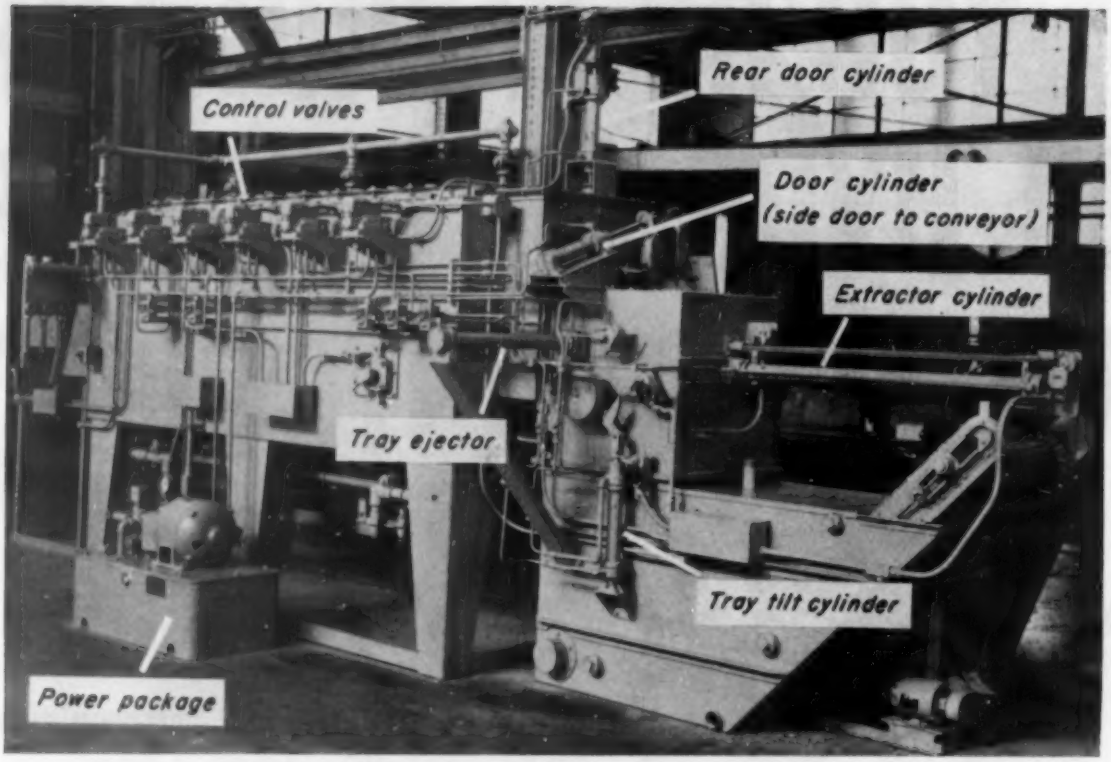


FIG. 1. THE HYDRAULICALLY OPERATED, electrically controlled continuous atmosphere hardening furnace installed at the Cinch Manufacturing Corp., Chicago. Five of the seven cylinders are shown and identified. The package power unit and the bank of six solenoid operated 4-way valves and a number of the actuating limit switches are also shown.

ELECTRICALLY CONTROLLED CYLINDERS

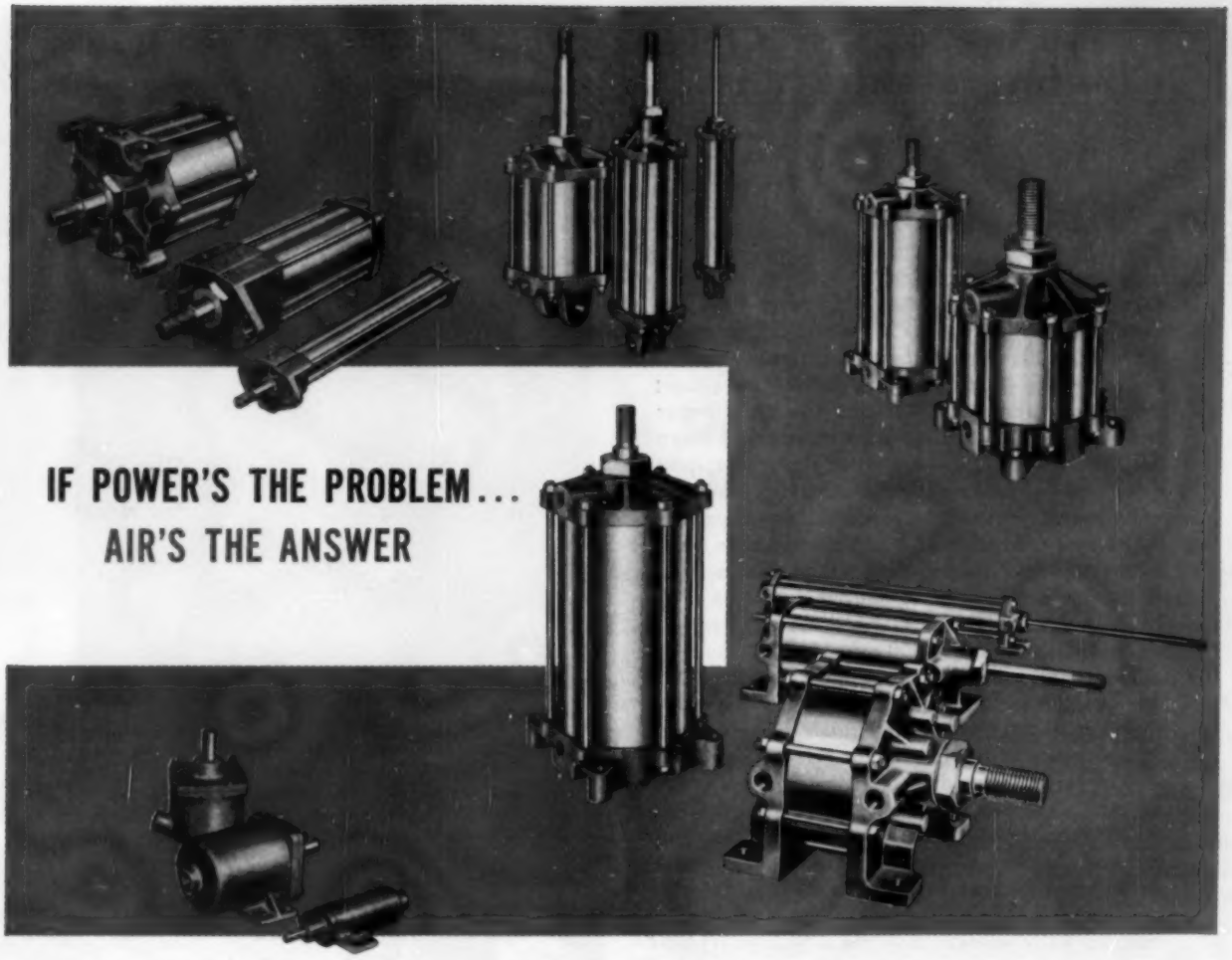
. . . power motions on a hardening furnace

About 300 pounds of parts are heat treated each hour in this furnace. Hydraulic cylinders do all the work of opening and closing doors and pushing in and pulling out the work trays. Combining limit switch control with hydraulic sequence valves assures proper cycling of the seven cylinders.

● By Hugh E. Pollard

A CONTINUOUS atmosphere hardening furnace, in operation at the Cinch Manufacturing Corporation, Chicago manufacturer of electrical contacts, tube holders and miscellaneous components for electronic devices, is operated by seven electrically controlled hydraulic cylinders. The furnace, consisting of three segments, a purging section, a heating section and a quench section, is used to process the parts for bright hardening and carbonitriding.

HUGH E. POLLARD, *Chief Engineer Air and Hydraulic Division, Lindberg Engineering Company, Chicago, Ill.*



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ELECTRICALLY CONTROLLED CYLINDERS

Both pneumatic and hydraulic cylinder operation were considered in the design of the furnace. Hydraulic operation was selected for several reasons. First, because heavy loads are usually involved and space was quite limited, the use of higher pressures and smaller cylinders was a distinct advantage; second, smoothness of operation was quite important; third, flexibility of speed control was essential; and fourth, it was important that better, positive control of positioning and indexing be assured.

Hydraulic pressure is furnished by a package power unit consisting of a single stage vane pump with a capacity of 4.5 gpm at 500 psi, and a 3 hp, 1200 rpm electric motor, both mounted on a 20 gallon reservoir. The normal operating pressure of the hydraulic system is 300 psi.

The seven cylinders in the system perform all of the operations with the exception of the submerged conveyor in the quench tank which is chain-driven by a separate motor. Five of the cylinders are actuated by single solenoid, 4-way, pilot operated valves. In turn, the front or loading door cylinder, the pusher cylinder, rear door cylinder, extractor cylinder and the tray tilt cylinder are operated, their stroke and reversal being controlled by tripping limit switches. The sixth single solenoid, 4-way pilot operated valve operates both the side door cylinder (opening to conveyor) and the tray ejector cylinder. Two sequence valves and a counterbalance valve in this part of the circuit insure that the tray ejector cylinder will extend only after the side door cylinder has retracted, opening the side door and, after a limit switch on the conveyor has de-energized the 4-way valve, return the tray ejector cylinder before the side door cylinder extends, closing the side door.

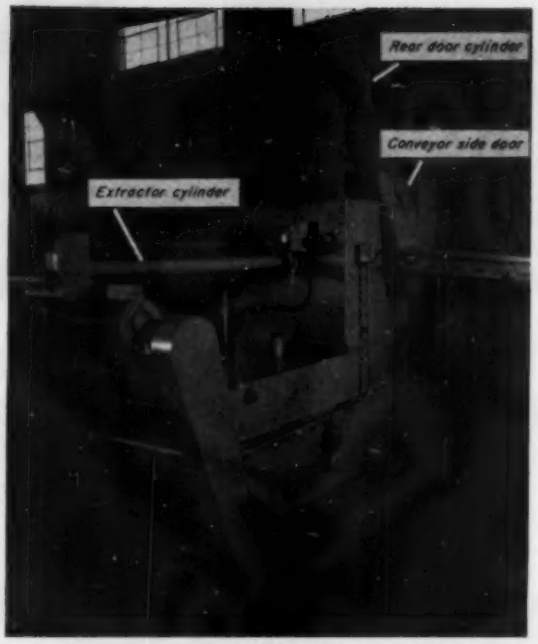

FIG. 2. THE QUENCH TANK with its separate submerged flight conveyor, horizontal extractor cylinder and side door cylinder arrangement at the discharge end of the furnace. The horizontal tray ejector cylinder, operated in sequence with the side door cylinder, is hidden from view at the left. The overriding pushbutton used for manual operation of the tray tilt cylinder engaging hook and the alarm are also shown.

THE OPERATION IN DETAIL

When the operator places a loaded tray on the charging table at the loading end, and a green signal light flashes, he depresses the start pushbutton. This energizes the first solenoid valve, which retracts the front door cylinder raising the front door. When the door is completely raised, this cylinder trips a limit switch, which energizes the second solenoid

Continued on page 86

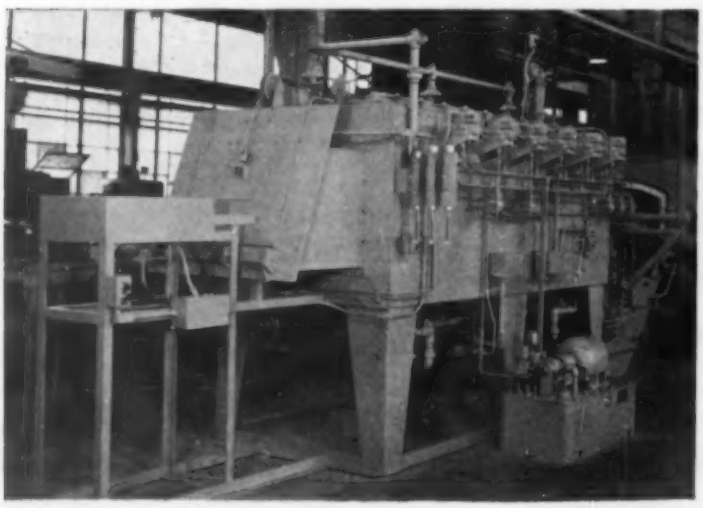

FIG. 3. THE LOADING END view of the furnace shows the arrangement of front door cylinder, the charging table and the start pushbutton. The horizontally mounted pusher cylinder is obscured by the hood of the charger table. The lower end of the gravity conveyor can be seen behind the table.

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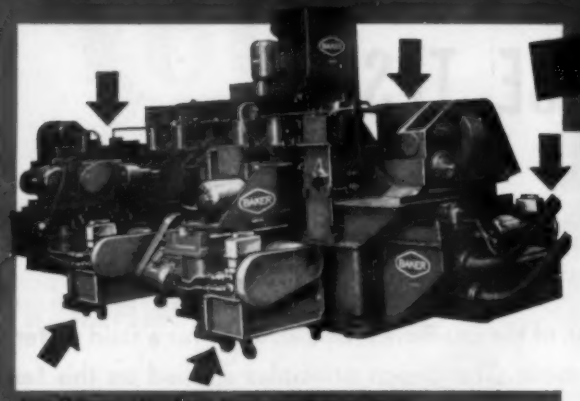

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The Oilgear "JK" Feed Pump offers many advantages, not the least of which are easy applicability and accessibility. There's no need in many cases for machine redesign and engineering. And this unit does so much to speed cycle time—traverse speed for example can be 265 times feed rate—that production rises dramatically and costs subside. Both coarse and fine feed rates can be varied infinitely so you at once discover the best rates for your work—and the automatic built-in compensator holds the selected fine feed *unvaryingly*. All functions are controlled automatically, semi-automatically or manually.

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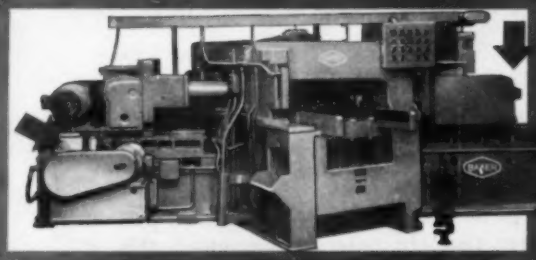

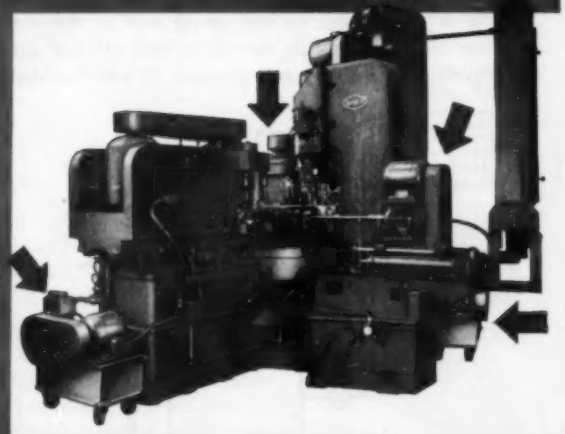

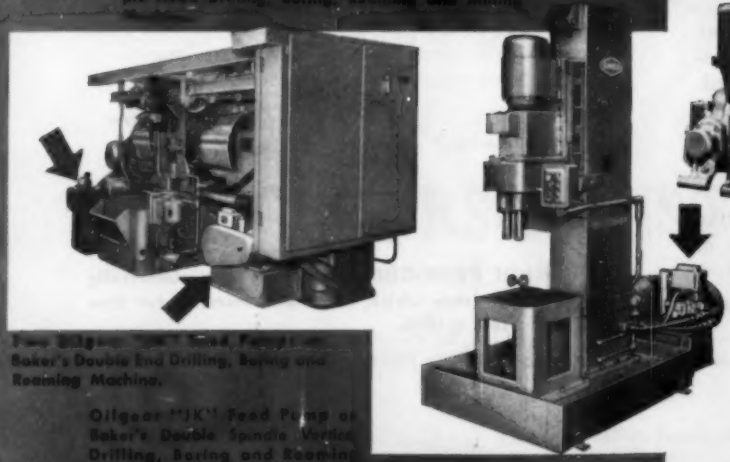

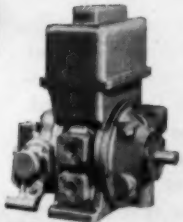

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Design and Construction of a METERING ORIFICE TESTER

● By C. R. Anderson

Accurate determination of the coefficient of discharge for a fluid metering orifice can be made. The design principles applied on this tester can be applied to meet other similar flow testing requirements.

BOTH air and hydraulic principles play an important part in the design of test equipment used by Bill Jack Scientific Instrument Co. to determine the discharge coefficient of metering orifices.

This tester combines relatively high speed operation with good accuracy to meet the needs of quality control on mass production of small precision metering orifices. It was designed for 20 to 300 psi. pressure and .2 to 2.5 lbs per second discharge rates using water as the discharge medium and will give the discharge co-efficient within ±0.15 percent with only moderate care by the operator. This unit was not designed with the view in mind of marketing it commercially, but was built up strictly for maximum utility and flexibility of operation in our own plant. For this reason, the tester is actually a group of items mounted together on one bench and is not packaged as a saleable item.

GENERAL DESCRIPTION

Figure 1 is a mechanical schematic of the system and Figures 2 and 3 are photographs of the general set-up. The orifice to be tested is screwed into the test tank partially filled with water and pneumatically pressurized to the desired pressure. The orifice is allowed to discharge into an open container for a measured time and the discharged water is then weighed. The novelty of the device lies not in the basic method, a weighing tank type of operation, nor in the method of obtaining the test tank pressures, but rather in the method of controlling and measuring the time of actual discharge. Since the accuracy required was on the order of 0.1 percent, some very positive means of timing the starting and stopping of the flow was necessary without at the same time causing the entrance conditions to be altered for any appreciable part of the discharge time. In order to accomplish this, it was decided that a plunger operated at the entry side of the test nozzle would be desirable using the test nozzle or its adapter as the actual seat of the cut-off plunger. To accomplish the open and closing action positively and quickly as required, it was decided to

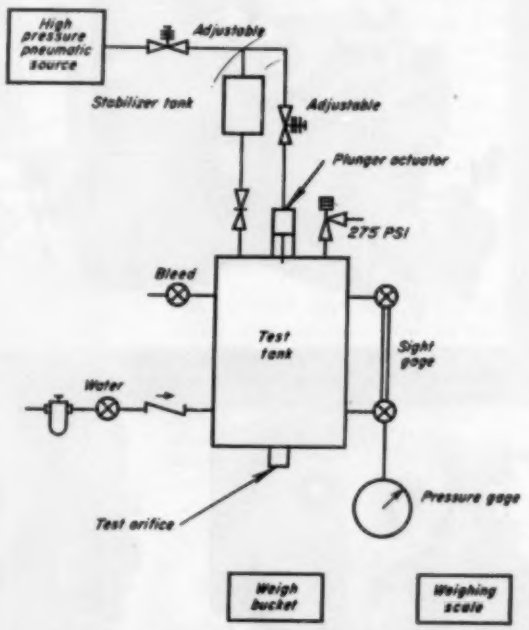

FIG. 1. HIGH PRESSURE AIR powers an electrically controlled air piston which stops and starts water flow through the test orifice.

C. R. ANDERSON, *Senior Research Engineer, Bill Jack Scientific Instrument Co., Solana Beach Calif.*

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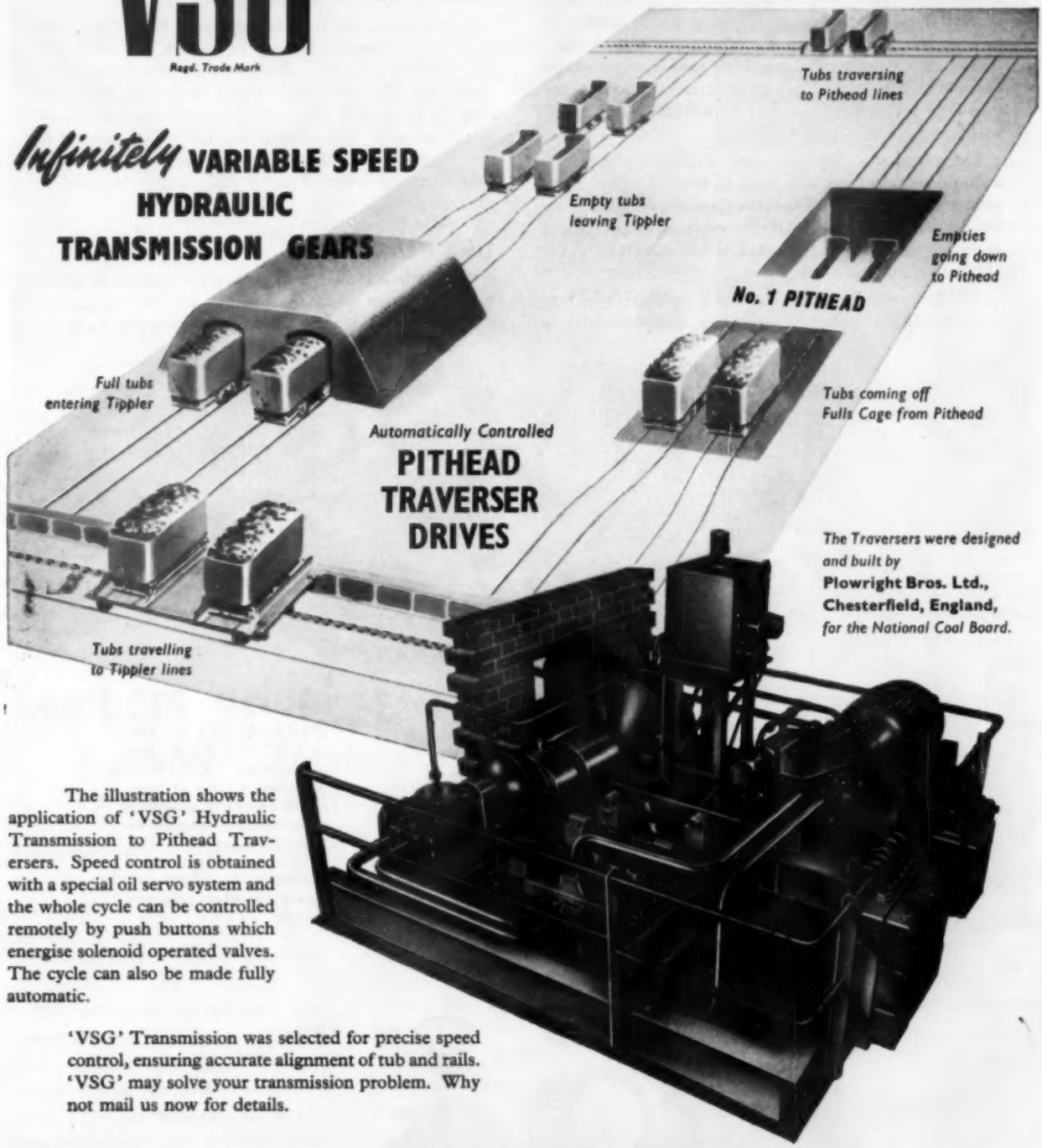
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motivate the plunger with a pneumatic cylinder. This method gave us the relatively long travel necessary to keep the plunger from disturbing the entry conditions coupled with relatively high speed action easily adjustable. The advantages of pneumatic actuation are thus very self-evident and very important in this application.

The pneumatic actuator used with the plunger is a double-acting type with built-in control valve. Solenoid action opens small poppets thus allowing the driving pressure to actually shift the valve. This equipment is very compact in design and is commercially available.

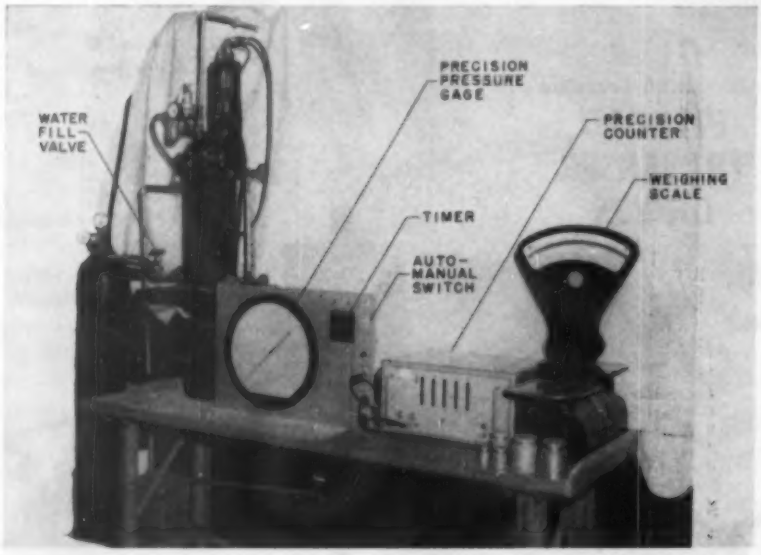
The test tank is approximately 8 inches ID by approximately 24 inches long and is equipped with a standard boiler sight gauge which enables the operator to tell when to re-fill.

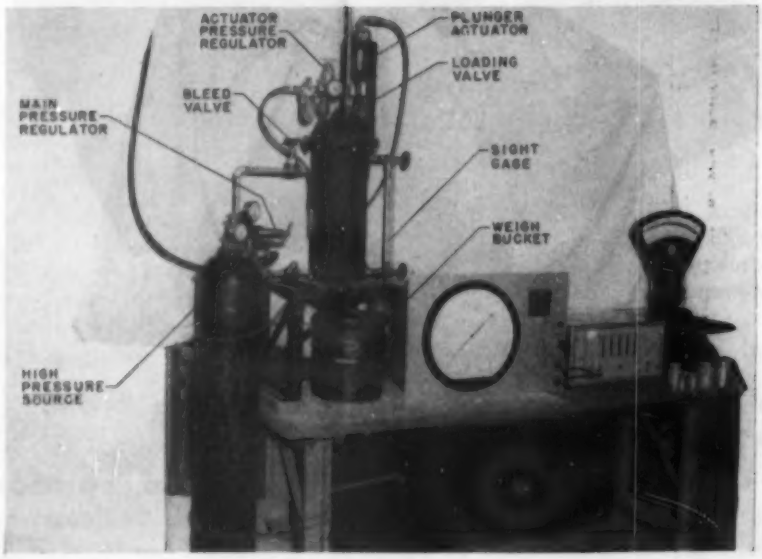
DISCHARGE MEASUREMENT

In operation, the test tank pressure and rough time duration of the test are set in on the control panel. The operator merely pushes a button which starts the discharge and the rough timer stops the test. The rough settings for pressure and time are determined from charts or instructions and the values are set to give a median weight of discharged water of 10 pounds. This water is weighed on a scale which is good to ± .005 pounds in 10.

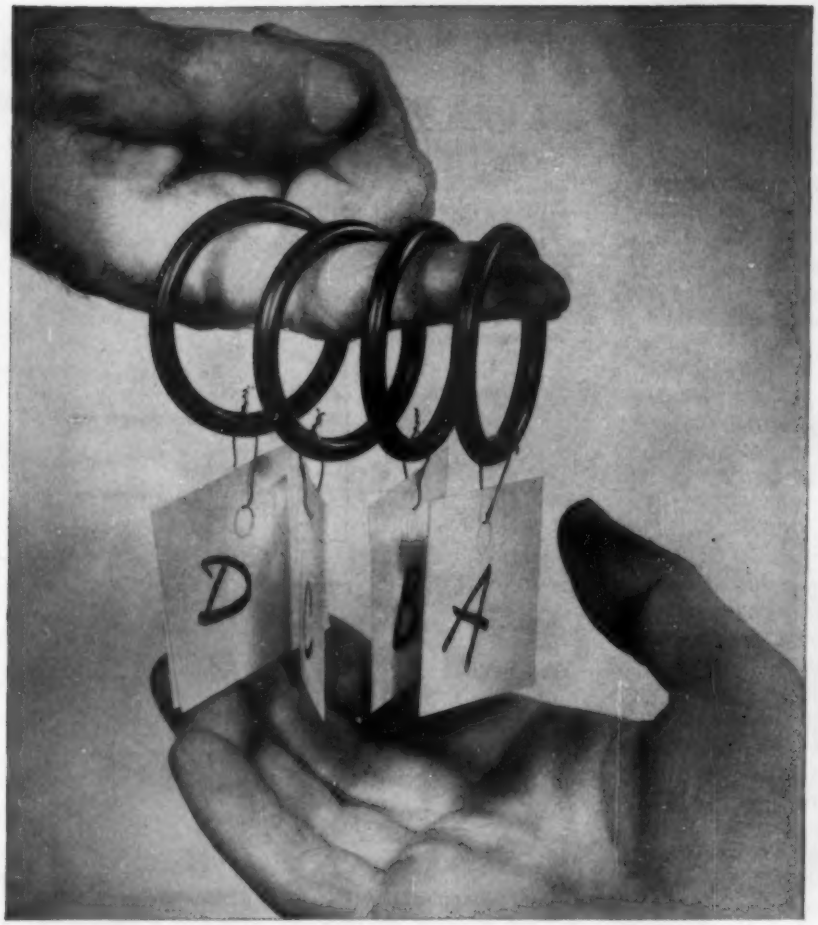
TIME MEASUREMENT

A switch actuated by the plunger rod is mounted at a convenient spot and is actuated by approximately a 1/16 inch movement of the plunger away from the





FIGS. 2 and 3. INSTRUMENTS for weighing the flow, measuring time of flow, and checking water pressure are selected to have high accuracy. The plunger actuator is powered by nitrogen from the high pressure bottle.



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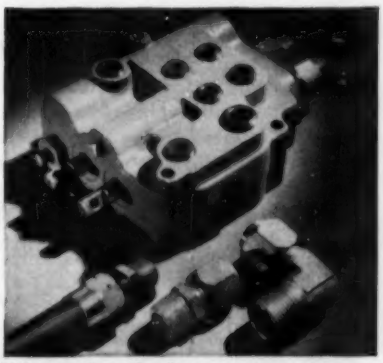

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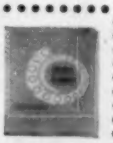

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test orifice. This switch controls the precision counter or timer which is accurate to better than one millisecond. The real accuracy of time measurement is probably on the order of ± 3 milliseconds due to the fact that the plunger does not move with infinite acceleration and speed although it does respond very rapidly.

A synchronous type 60 cycle clock in place of the precision counter is not acceptable, however, unless run with a frequency standard, because the instantaneous or short time regulation of the commercial power lines is not good enough in this locale.

PRESSURE MEASUREMENT

One of the most difficult problems was that of pressure measurement. In order to hold the overall accuracy, it was necessary to measure the pressure to one part in 500. It was finally decided to use a custom made gauge commercially available which had a guaranteed accuracy of one part in 500 and a usual accuracy of one part in 1000 using a correction table supplied with the gauge. This gauge can be seen in Figures 2 and 3. It is 18 inches in diameter and can be read to ±0.1 of a psi. In this way, we obtained good accuracy also at low pressures, thus obviating any necessity of using a mercury U tube, and providing simpler, more foolproof operation.

PNEUMATIC PRESSURE SOURCE

Figures 2 and 3 show the high pressure source to be commercially bottled nitrogen such as normally used in welding. Since these photographs were taken, we have installed an auxiliary line from our 180 psi compressor system, properly filtered, which is used to charge auxiliary receiver tanks. Thus, it will only be necessary to use the bottled nitrogen supply for the test points above 180 psi. This will result in a considerable saving in nitrogen. The reason nitrogen was used instead of air was merely that in our particular locality, the bottled gas suppliers are selling the nitrogen cheaper than air.

In the electrical system provision is made for both manual and automatic pulse operation of the pneumatic actuator. As indicated previously, on automatic mode, the test is initiated by depressing the start button on the timer, which is a simple commercially made 60 cycle synchronously driven model. The pulser was added merely in the interests of gas saving, since the actuator valve poppets remain open as long as the associated solenoid is energized. Leaving the poppets open is unnecessary once the valve has been positioned.

CHOICE OF BASIC TEST METHOD

Since the basic quality control requirements demanded uniformity of the discharge co-efficient within ±1 percent, it was necessary that the test equipment

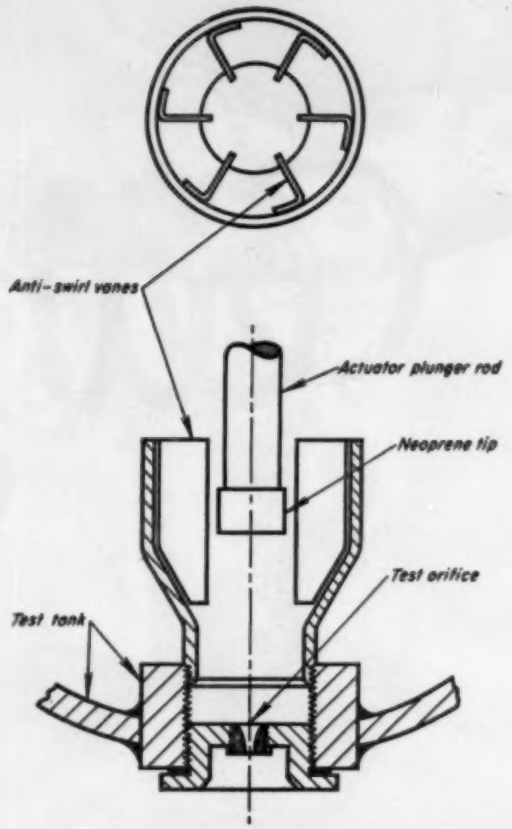

FIG. 4. CROSS-SECTION drawing through the orifice at the base of the test tank shows the flow straightening device which was added to remove the effects of swirl which had been causing variable results.

should measure to better than ±0.2 percent in order that a 1 percent change in the discharge co-efficient would be statistically significant to the test equipment. This entailed equipment not ordinarily found completely built. Since it was desirable to allow the orifice jet to be unimpeded by back pressures entailed in using closed circuit flowmeters, and because of the difficulty in obtaining quickly continuous reading flowmeters of the accuracy necessary, and because visual inspection of the jet was required, it seemed desirable to use a method which would allow the jet to shoot into free air, while at the same time not requiring equipment too difficult to obtain. A weighing tank apparatus meets these requirements.

DISCUSSION OF FLOW ENTRY

Early tests indicated a scatter in results greater than that to be expected. It was finally decided that appreciable swirl must be occurring in the test tank. Therefore, a flow straightener was added (See Figure 4) which apparently solved the problem, for subsequent statistical runs yielded scatter well within the desired accuracy range. The combination of vanes and the nozzle effect in the entry area have the effect of suppressing the large discrepancies and smoothing out the small ones to the point where the flow leading to

Continued on page 84

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Metering Orifice Tester

Continued from page 82

the orifice entrance is relatively straight and uniform. The correction for approach velocity is included in the computation procedure.

Designation of Symbols:

- C_d = Orifice discharge coefficient.
- W' = Flow rate, lbs/sec.
- A = Orifice throat area based on spec. dia., ft².
- A_1 = Effective approach diameter upstream from nozzle entrance.
- ω = Specific weight of test liquid (water) = 62.30 lbs/ft³ at 70°F. and atmospheric pressure.
- g = Standard value of gravity accel. = 32.2 ft/sec².
- h = Equivalent water column height for pressure at nozzle, ft. $= \frac{p}{\omega}$
- W = Measured weight of water discharged in time, t, lbs.
- t = Measured time to discharge W lbs. water, secs.
- k = Unit conversion factor (= 144 if p is in psi).
- p = Pressure at nozzle entrance, psi.

COMPUTATION METHOD

The computation is relatively easy. The fundamental equation is:

$$W' = C_d A \omega \sqrt{\frac{2 g h}{1-\left(\frac{A}{A_1}\right)^2}}$$

$$\therefore C_d = \frac{W'}{A \omega \sqrt{\frac{2 g h}{1-\left(\frac{A}{A_1}\right)^2}}} = \frac{W}{A \omega t \sqrt{\frac{2 g k p}{\omega\left[1-\left(\frac{A}{A_1}\right)^2\right]}}}$$

This takes the form:

$$C_d = K_1 K_2 \frac{W}{t\sqrt{p}} \qquad (1)$$

$$\text{Where } K_1 = \frac{\sqrt{1-\left(\frac{A}{A_1}\right)^2}}{A\sqrt{2 g k}}$$

$$\text{And } K_2 = \frac{1}{\sqrt{\omega}}$$

K_2 is actually a function of test water temperature and pressure. Filtered tap water is actually used for the test, but it has been found that its temperature

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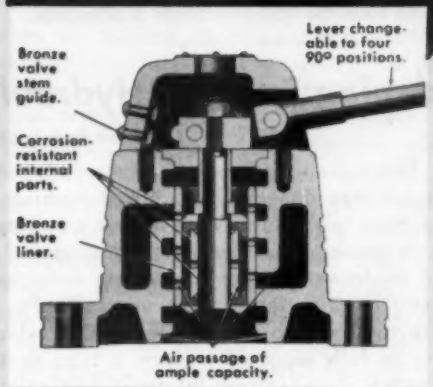
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changes very little during the course of a year and, therefore, a median value for K_2 has been chosen and computational charts have been made up on that basis covering the test points that have been specified, using equation 1. The values W, t, and p are predetermined from the tester as previously discussed. For each selected value of K_1 or K_2, a new chart with the pressure lines shifted accordingly is necessary, however.

CONCLUSION

This special purpose tester utilizing pneumatic and hydraulic principles throughout is characterized by an unusual combination of very high accuracy with easy, high speed operation requiring no special techniques. One operator can easily obtain 30 test points an hour with the present handling method for weighing the discharge. It would be very easy, if necessary, to change the weighing procedure such that practically no handling of the weigh bucket would be necessary, thus decreasing the time required even further; but at the present time the test procedure is adequate. ▼▼▼

Hardening Furnace Hydraulics

Continued from page 76

valve. This extends the pusher cylinder, advancing the loaded tray into the furnace and pushing the line of trays in the furnace ahead one tray length. When the pusher or loading cylinder has reached the end of its forward stroke, it contacts and trips a limit switch which reverses the solenoid valve, retracting the loading cylinder. When this cylinder reaches its fully retracted position it trips another limit switch, de-energizing the front door cylinder valve, thus closing the front door.

As the trays advance one position, the first tray loaded is in the unloading position where the tray trips a limit switch, which starts the heating cycle timer. This timer actually controls the entire cycle. When the timer starts it automatically "locks out" the loading cycle so that no more trays can be put into the furnace. At the end of the present time interval the timer initiates the unloading cycle by energizing the solenoid valve that controls the rear door (quench chamber) cylinder. This cylinder retracts, raising the door. A double end rod cylinder is used to provide a convenient means of tripping a limit switch rather than coupling a shifter rod to the piston rod.

When the rear door is fully raised a limit switch is tripped, energizing a solenoid valve controlling the extractor cylinder. See Figure 1. The piston of this cylinder is then advanced into the furnace and, as it reaches the end of its forward stroke a hook, fastened to the end of the piston rod engages the tray to be extracted. At the same time a limit switch is tripped de-energizing the valve and retracting the cylinder. If, for any reason, the hook should fail to engage the tray an alarm bell will ring as soon as the cylinder begins to retract. To take care of such a contingency a pushbutton at the extraction end of the furnace can be depressed to override the automatic cycling and advance the hook into the furnace again until it does engage the tray properly.

As the tray is extracted from the heating chamber, it is pulled into a framework cage; the hook disengages automatically as the cylinder retracts to its normal position. The same limit switch which started the retraction stroke also energizes a 2-way solenoid valve in the vent line of the pump relief valve. This drops the system pressure to the setting (about 80 psi) of the remote relief valve during the retraction stroke. This precaution is taken so that in the event the extractor hook did not release properly there would be no danger of damage to the cage.

The framework cage is mounted on a shaft directly over the quench tank (Figure 2). When the extractor cylinder is fully retracted it trips a limit switch energizing a solenoid valve which controls the tray tilt cylinder, and another limit switch which de-energizes the solenoid valve controlling the rear door. Since it is necessary to rotate the trays slowly so that the parts in the tray will trickle out and fall into the quench almost individually, speed control valves are installed on both the supply and return lines of this cylinder. Further, since it was desirable to jostle the tray near the end of the cylinder stroke to insure that the tray is emptied completely, a two way cam operated valve which by-passes the speed control valve in the supply line is used to increase the cylinder speed near the end of its stroke.

When the tray tilt cylinder trips a limit switch at the upper end of its stroke, its valve is de-energized, retracting the cylinder. This returns the tray and cage to an upright position. As the cage is returned to its normal position a limit switch is tripped energizing the valve which controls the side door cylinder. The piston of this cylinder is extended when the side door is closed (Figure 2). The valve retracts the cylinder opening the side door. When this door is fully open the sequence valve operates the tray ejector cylinder. As the cylinder rod extends it pushes the just emptied tray out of the cage, through the side door and onto the gravity roller conveyor. The empty tray is returned on the conveyor to the operator at the loading end of the furnace.

As the empty tray rolls down the conveyor it trips a limit switch. This de-energizes the solenoid control valve causing the ejector cylinder and the side door cylinder to return to their normal positions; this order of operation being assured through another sequence valve. When the tray trips the limit switch on the conveyor, the green light is again flashed, signalling the operator to load another full tray into the furnace.

When the work drops into the quench tank, it rests on the surface of a submerged flight conveyor. This conveyor carries the work out of the tank and deposits the pieces in a receptacle. When the operator comes to the end of a job and has loaded the last full tray into the furnace, he continues to load empty trays until the last full tray has gone through the complete cycle. When the last full tray has been processed, the furnace can be shut down with the thirteen empty trays in the furnace ready for the next run of parts. ▼▼▼

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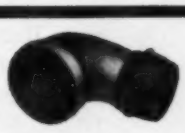
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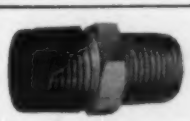
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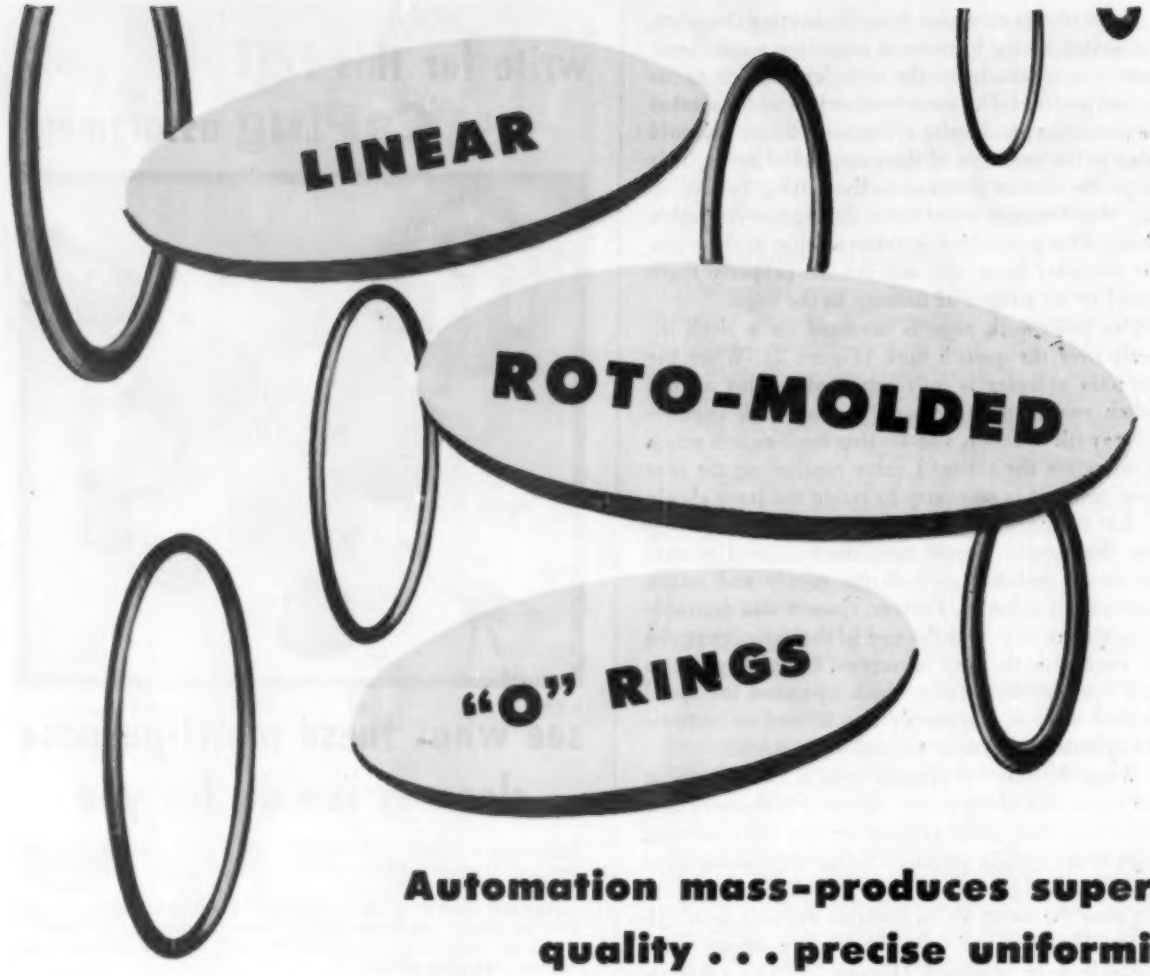

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Problem Clinic

It may seem silly to ask how you locate noise in a hydraulic system. Your two ears usually have no difficulty in letting you know that the noise is there. The problem, of course, is to find the source and then to eliminate it. Here's the experience one engineer had with hydraulic noise. He combined engineering talent with persistent sleuthing to come up with a quiet hydraulic system.

Here's How We Solved

OUR HYDRAULIC NOISE PROBLEM

● By Henry F. Gray

A COMPLAINT was made that a prototype variable stroke piston type hydraulic pump with a gear type replenishing pump was making too much noise. The pump was driven through a flexible coupling by a five horsepower, three phase, 1725 r.p.m. double ended electric motor. The opposite end of the motor shaft was coupled to a load requiring heavy starting torque. The three units; pump, motor and load, were mounted on an 18-in. x ½-in. iron channel 10-ft. long. The channel iron was supported near each end and under the motor on 8-in. x 8-in. wooden timbers placed crosswise. The timbers resting on a concrete floor.

HENRY F. GRAY, *Doble Engineering Company, West Somerville, Mass.*

If ten or more of these units were in the same room, not only the sound from each unit, but the beat or harmonics of two or more units would be more than a human being could endure.

Two methods of approach were tried to eliminate the disturbance.

The first method was to employ a consulting acoustical engineer, who came with his sound and vibration measuring equipment, he proceeded to locate the disturbance, to determine its characteristics and then recommended the following: Make a rectangular sheet metal case with a semi-cylindrical top, open at the bottom and long enough to cover both pump and electric motor. The ends of the case having slots cut upward from the bottom to allow the placing of the case down over the shaft. The bottom edges were turned out approximately 2-in. at right angles. A second sheet metal enclosure was to be made, shaped like the in-

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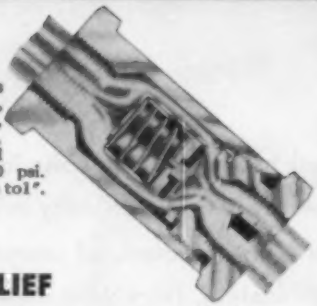

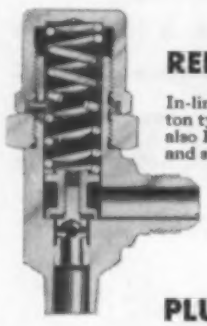

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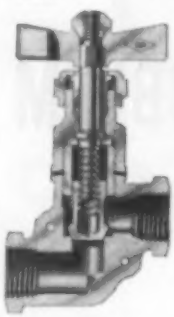

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HOW WE SOLVED A NOISE PROBLEM

side case but 2-in larger on sides, ends and top. The 2-in. space between the inner and outer cases were filled by compressing a 6-in. thick sound absorbing glass wool type of insulation into the 2-in space. The sound resisting chamber was then placed over the motor and pump. The slots at each end were closed with the same type of 2-in. thick insulating plugs.

Not only did this chamber let a considerable amount of sound escape down through the sounding board base but also some through the protruding shaft. Also, heat from the motor and pump soon caused failure resulting in lost time, material and money.

The problem was then undertaken by the second method based on first determining what kind of sound was giving the trouble, as there were many noises, combination of noises and personal opinions. The disturbance was described as a high pitched continuous whine. This sound was imitated by blowing air through a 4-in. steel disk, having 40 small holes drilled near its circumference. The siren disk was mounted on the output shaft of a variable speed transmission which gave perfect speed and variation control. A jet of compressed air, the velocity determined by the pressure registered on a common gauge, was blown into the holes in the disk. A change in the speed of the disk changed the pitch. Varying the air pressure affected the loudness of the sound but did not affect its pitch.

This test apparatus was then operated at various combinations until all agreed that a sound similar to the one which disturbed the critics had been produced. This sound was produced at 600 cycles per second, with an air pressure of 30-32 psi. The sound was measured by sound measuring equipment for its exact frequency and its intensity in decibels. An increase in decibels was noted when the imitating siren was run at the same time and frequency of the pump.

It was decided that the noise might be caused by one or more of the following:

1. Unbalanced Parts
2. Poor Fits
3. Electric Motor Noises
4. Piston Noise
5. Mechanical Interference
6. Cavitation
7. Gear Profile
8. Trapped Oil Compressed to a High Pressure
9. Displaced Oil Pulsations.

Here's how we went about checking out each of these possible causes.

1. Sound tests had to be taken when disturbances from other equipment was eliminated. The quality characteristics of the noise seemed to eliminate 1, Unbalanced Parts, as there were no definite critical speeds.

2. The disturbance was too uniform for 2, Poor Fits.

3. Tests run during the starting of the motor while machinery was coasting, and with power shut off, showed the sound was independent of electric power. This eliminated 3, Electric Motor Noise.

Continued on page 92

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Tool Room Superintendent Max Chase (left) and Production Engineer Peter Van Dyke (right) with Standard lubrication specialist R. T. Cleland inspect frame of extruded aluminum. Bob Cleland, a graduate of Michigan State with a B.S. in Mechanical Engineering and of Standard's Sales Engineering School, has the background to provide customers with competent technical service on their lubrication problems. This training and experience, customers have found, pay off *for them.*

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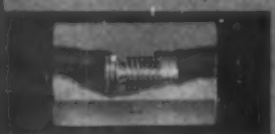

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4. A test was run with the main pump pistons removed. The noise was still there which eliminated 4, Piston Noise.

5. With pistons removed, a test was started with no oil for suction to the replenishing pump. The noise was present until a speed was reached when the oil was apparently thrown out from between the teeth of the gears, then they ran quiet. If it had been mechanical contact causing the noise, it probably would not have disappeared so quickly. This discarded 5, Mechanical Interference.

6. Tests were run with 10 to 15 p.s.i. air pressure on the enclosed oil sump to supercharge the oil to the replenishing pump. No change in sound was noted. Also the quality of the sound was not that of cavitation or a starved pump. Cavitation 6, was out.

7. It was suggested at the start, that a change of pressure angle of the gears from 14½ degrees to 20 degrees would stop the noise. This was tried but in this case it made little or no difference. Gear Profile 7, was not the cause.

8. The 600 cycles per sec., its fundamental or harmonic corresponded quite closely with twice the product of the number of teeth (20) on the driving gear and the rpm. (1725) of the pump shaft. Also the location of the origin of the sound, as discovered by an acoustic pick-up applied to some fifteen points distributed all over the equipment, placed the origin near the meshing point of the replenishing gears. Sound was picked up through the pump housing. Examination of this type of replenishing pump will show small trapped volumes of oil between the teeth. These slugs of oil were being compressed at the rate of 2x20x rpm times per minute; therefore, if these slugs of trapped oil could be ported out any noise caused by this compression would be reduced or eliminated.

To release this trapped oil a brass disk with a porting passage was made and placed against the replenishing pump cover plate. Disfigurement of the pump was not permitted. The original plate apparently had the right idea to eliminate the trapped oil, but it was being applied to the wrong side of the gear due to the helix angle.

A plate was then designed and applied to the other side of the gears with much better results. This would indicate 8, Trapped Oil Compressed to a High Pressure had caused some of the noise.

9. An accumulator was installed on the delivery of the replenishing pump to eliminate pulsations of displaced oil, with little or no improvement. The acoustic tests located the source, not in the passageways leaving the pump or piping, but nearer the delivery chamber. The frequency of these pulsations was again equal to twice the number of teeth on the driver, times the rpm. Therefore, if these sudden pulsations could be absorbed as close as possible to the point of origin, any resulting noise will be absorbed or reduced. This point was proved by inserting a spongy neoprene-like material in a screened cage in the delivery chamber of the pump. Nearly all of the noise left after the porting experiment was absorbed, without reducing the output. 9, Displaced Oil Pulsations was solved.

The acoustical equipment used was a great help in tracking down the solution and a little Yankee ingenuity did the rest. ▼▼▼

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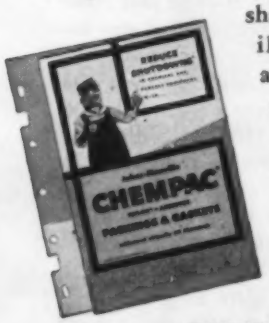

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FLOW METERING DEVICE

. . . for high pressure systems

• By Allan Stone

HIGH performance aircraft have placed unusual demands upon their hydraulic and pneumatic actuating systems. Not the least troublesome of these has been the requirement for accurate metering of fluid to the various sub-systems and components. When very low flow at high pressure drop is specified the problem becomes acute.

In order to operate wing folding cylinders one specification called for 50 cubic inches of hydraulic fluid per minute to flow at a pressure drop of 3000 psi; while an emergency hydraulic system required its fluid level to be maintained by dripping five cubic inches per minute into its reservoir at a pressure differential of 1500 psi.

The usual sharp edged orifice type metering device proved notably unsuccessful in these and other similar cases. The orifice diameter required was too small to be machined by standard practices; the results of such machining were not consistent and costs were high. In addition, it was found that to protect orifices in the order of .004 inches diameter from clogging an elaborate filtration system had to be built into the metering valve.

A unique component which yields the required performance has been made available to the industry. Known as the "Pin-Type Restrictor Valve", it is shown in typical form in Figure 1.

Utilizing a pure nickel orifice tube and a high speed steel gage pin as its metering device, the valve

ALLAN STONE, *Asst. Chief Engineer, GAR Precision Parts, Inc., Stamford, Conn.*

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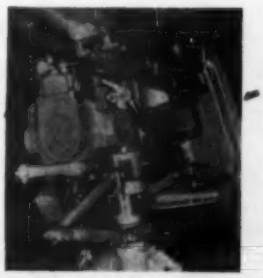
Loud was the originator of the first package assembly including power steering cylinder, steering control valve, shimmy damper, damping orifices, and thermal temperature compensators all in one unit assembly. Loud was the first large volume producer of this rotary output assembly steering unit, and has now become one of the largest producers of power steering for aircraft in the country.

"Producing Today... Tomorrow's Aircraft Requirements" has resulted in many "firsts." An example is the design and development of electrical control for power steering, to replace all mechanical connections between pilot and nose wheel. Now the pilot has closer control than ever before obtained, with considerable savings in weight and initial cost, as well as installation and checkout time in the airplane.



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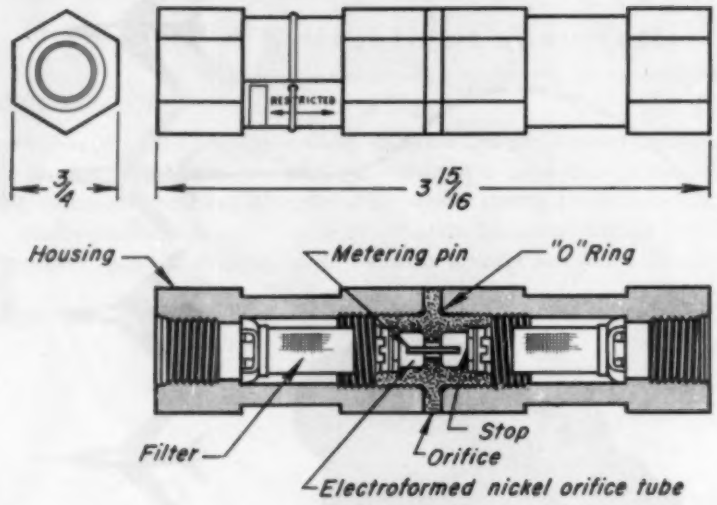


FIG. 1. NICKEL ORIFICE TUBE is pressed into place after the fitting is heated so that a press and shrink fit is obtained. Under pressure, the metering pin floats in the orifice.

incorporates two screen type filters with .008 inches spacing. The housings and coupling are of high strength aluminum alloy, or of stainless steel.

The nickel orifice tube is formed by the electroforming process. In this process pure nickel is electrodeposited on a ground steel mandrel of specified diameter. After depositing the nickel the outside surface is ground and the mandrel removed. The nickel tube then is pressed into the coupling. This electroformed tube is held to a diametral tolerance of ±.0001 inches.

The steel gage pin is then placed in the orifice tube and retained by stops on either side of the coupling, which in turn are retained by stainless steel "Groov-Pins". The gage pin is precision ground and lapped to a diametral tolerance also of ±.0001 inches.

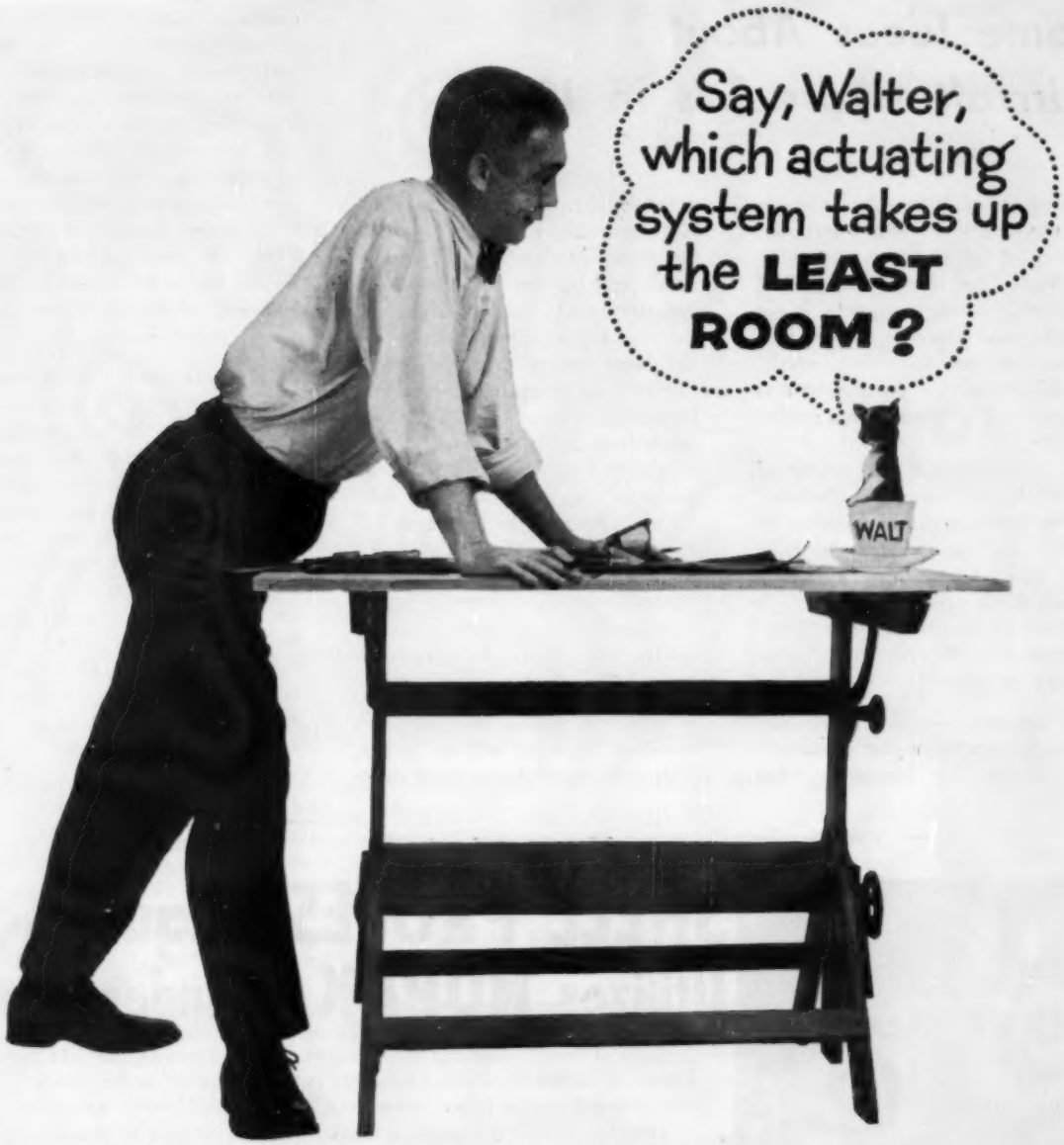
METERING PIN CONTROLS FLOW

By maintaining the same diameter orifice tube and varying the pin diameters any desired flow can be obtained. This valve construction offers the advantage of accurate uniform metering of very low flows, coupled with the ability of reproducing the same flow characteristics in any number of units. The elimination of drilled holes removes the chief source of variables in the metering orifice. The accuracy of the metering properties of the valve are dependent only on two easily measurable pin diameters: that on which the nickel tube is electroformed, and that of the gage pin.

By using the large orifice and then "filling it up" with a pin the problem of dealing with infinitesimals is avoided. The movement of the pin in the orifice tube provides a self cleaning effect, aiding the filters in protection of the unit from clogging. The possibility of a bit of sludge in stopping off the complete annular opening between orifice and pin is remote. An additional protection is provided by the fact that the electroformed nickel is non-corrosive and long wearing. This feature is especially appreciated in pneumatic systems where moisture in the air could cause severe damage to surfaces other than nickel.

Flow control of small quantities of oil in high pressure systems is difficult. A sharp edged orifice becomes too small. "Filling up the hole" with a metering pin provides an economical solution.

The solution to metering very low flows at high pressure drops is especially timely. With system pressures ranging from 1500 through 5000 psi the designer has been faced with the choice of using larger capacity cylinders and components than actually needed, or "designing around" the metering device. He can now utilize to their maximum advantually needed, or "designing around" the metering pressure system. ▼▼▼



When it comes to saving space, *nothing* beats pneumatics! Pneumatic systems use smaller lines, and *no* return lines are required. In fact, parts of the aircraft itself, such as landing gear struts, can be used to store air under pressure, saving you *additional* space and weight!

This "storage" feature has another advantage — it lets you build up *high* horsepower delivery from a *low* horsepower source, *without* paying the usual weight premium.

Pneumatic systems always act fast, are never sluggish. Viscosity of the air used in pneumatic systems remains essentially the same throughout a broad temperature range . . . −65° *to* +250°.

The air used in pneumatic systems cannot burn, so there's no danger from fire. And, since the air supply is always available, leakage is no serious problem. The compressor itself will compensate for any minor leaks which might occur.

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Some Ideas About Aircraft Hydraulics in 195X

• **Dependability**—A dependable system is one where the chance of failure from any cause is small. This is still the goal of hydraulic system designers. It's a tough goal because, each new plane requires individual study. What's important on a fighter is not necessarily critical on a guided missile.

Dependability is the product of reliability and immunity. Reliability or performance of a system or component can be measured by life tests. To achieve immunity which is the probability that there will be no failure from external causes, presents entirely different design problems.

• **Immunity**—Use of the airplane plays a large part in successful design for immunity. For example, it might be that a large, thin, hydraulic reservoir of which the outer fuselage skin forms a side might be best for a commercial transport but it might be suicidal for a fighter because of the large target area presented. Possibly an exceptionally reliable hydraulic system would weigh so much that an interceptor aircraft would be handicapped by lack of performance, particularly climb. In other words, the immunity of the airplane has been reduced. In such a case a less reliable but lighter hydraulic system might actually make the airplane more effective, allow more planes to come home, and be safer for the pilot.

• **What is going to happen?**—Some airplanes will be larger. This will entail larger and more numerous power plants but they will still be remote from the places that power will be needed for auxiliary services or powered controls. This will mean longer lines and larger loads. Hydraulics will be even more important than it is now, particularly because of the large powers needed for controls. Even the planes which are not larger than today's will go faster, and will need more power in the servo control system.

• **Temperature conditions**—They are getting more severe. What will be the temperature of the air due to aerodynamic heating in the future? That depends on the speed and altitude attained. High temperatures are not the only temperature hazards. Flights across the polar regions point to the development of polar landing fields. Once down on such a field the airplane must be capable of again taking to the air regardless of temperature conditions. Also extreme altitude may subject com-

Continued on page 100

Shell Process Bonding Machine Equipped with NOPAK 8" Model D Cylinder.

This machine which produces shell molds employs 2 NOPAK Cylinders to invert investment box and to open the louver which releases the mix.

SHELL PROCESS Equipment Utilizes NOPAK Cylinder Power

Builder of "Shell Molding" Equipment... Shell Process, Inc., of Chicopee, Mass., employs NOPAK Cylinders in a number of its machines to provide the controlled power necessary for their successful operation.

The top illustration shows a bonding machine utilizing the shell molds produced in the machine pictured below. An 8" Model "D" NOPAK Cylinder advances and retracts the upper pressure plate which, in turn, applies the pressure, through pins and springs, required to seal the two halves of the shell mold before molten metal is poured between them.

The lower picture shows a machine which produces shell molds by the investment process, employing a 4" NOPAK Cylinder to operate the louver of the investment box containing the sand and resin mix which is deposited on the heated pattern. A 6" NOPAK Cylinder, visible in base, rotates the investment box 210°.

Whether you build machines for resale, or for use in your own plant, NOPAK Cylinders and Valves can be used to your advantage in the efficient application and control of fluid power.

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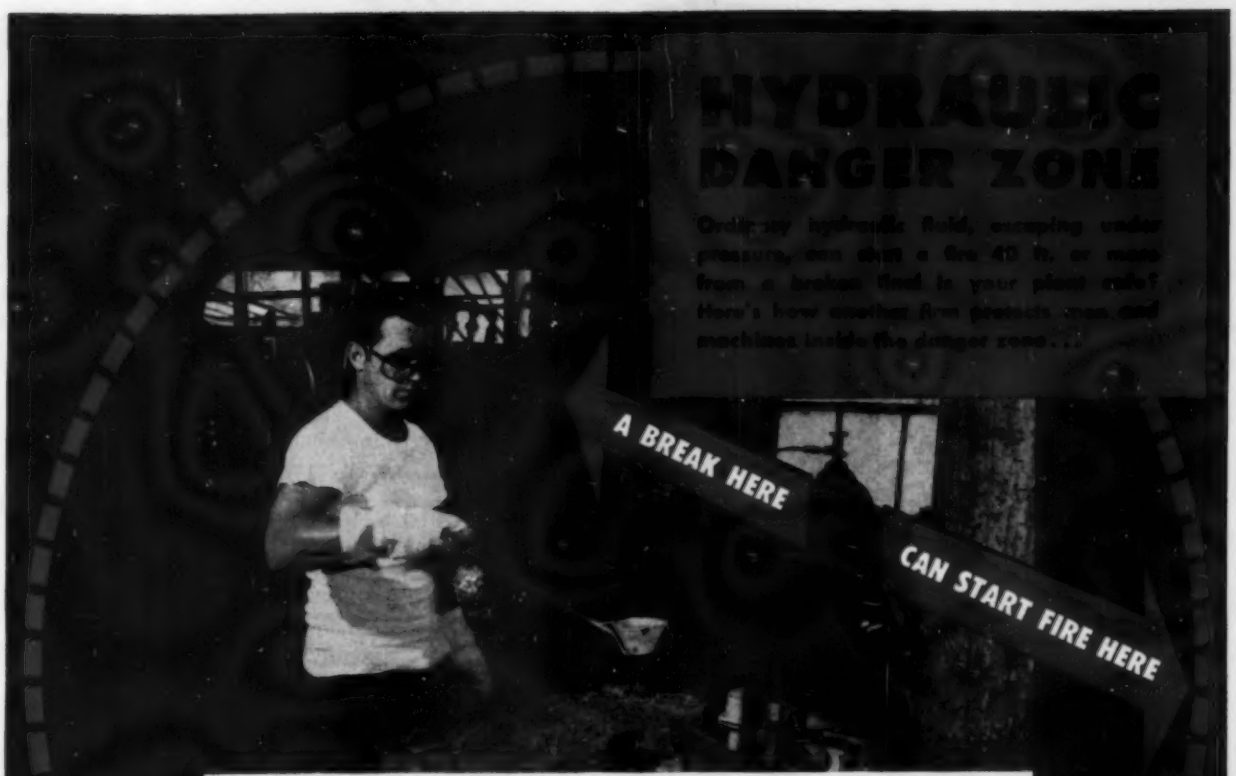

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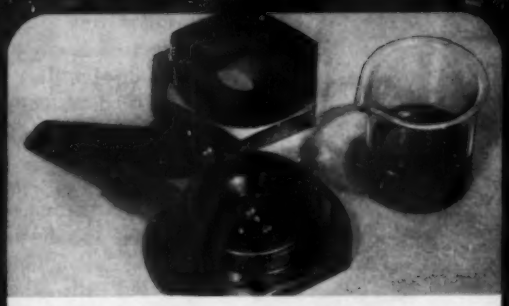

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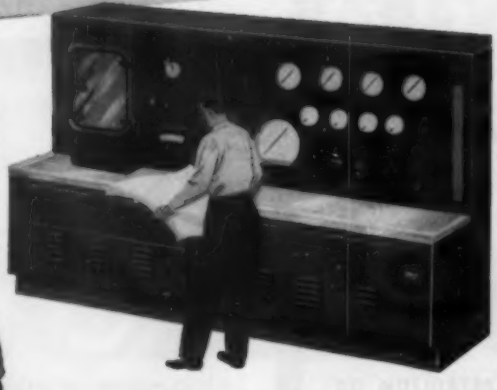

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Aircraft Hydraulics in 195X

Continued from page 98

paratively slow airplanes to conditions where little used hydraulic units will get very cold. Operation at –100°F must be possible.

• **Guided missiles**—A few years in the future will find a much smaller proportion of military airplanes inhabited. Most of the inhabited airplanes will be large transports or freighters. The fighting function will be largely performed by uninhabited craft. Some will be missiles and expendable while others will be radio controlled and recoverable. None of these newer military types will simplify the control problem. The large transports will need large, very reliable hydraulic systems because of size and large numbers of lives involved. The uninhabited craft will have to have very reliable hydraulic systems because no pilot is aboard to correct for mechanical or electrical mistakes. The short time of a missile flight may be misleading because for this short time the reliability must be very great and adjustment may take several hours on some sort of test facility.

• **Auxiliary power plants**—It is probable that on nearly all large aircraft separate auxiliary power plants will be used to operate generators, hydraulic pumps, etc. This in itself should add to the reliability since auxiliary power loads will not be taken from the main power plants when they can be least afforded. Instead of having very widely separated hydraulic pumps positioned by the main power plants, there will be a dual system of hydraulic pumps separated only far enough for protection against gun fire.

• **Hydraulic fluids**—A hopeful source of improvement in dependability is to develop a fluid which will operate better and at the increased temperature range. The properties this fluid will have to have are somewhat similar to pres-

Continued on page 102

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When you discuss solenoid valve requirements with an ASCO Engineer, you are benefiting from the design and development experience of half a century. The ASCO specialist can recommend the *right* valve for your needs because that leadership has resulted in the more than 1300 types of solenoid valves now available:

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Aircraft Hydraulics in 195X

Continued from page 100

ent properties but changed in degree and importance. The five most important properties needed are: long wearing properties, corrosion protection, temperature suitability, high viscosity index, and compatibility with finishing and insulating compounds to avoid loss of dependability of other systems.

Since the temperature will be high, the flash point and autogenous ignition points should be high although non-flammability while desirable, would have a low priority. It would seem more logical to prevent an excess of flammable fluid reaching a break in a line than handicapping a whole system because of lack of other essential properties.

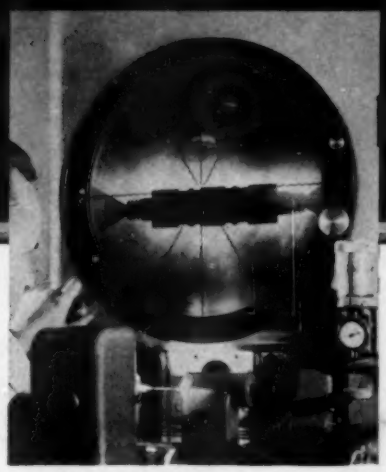
• **New valving**—A different type of valving, particularly in servo systems, will have to be used not only because of manufacture but also because of practical limitations on protective devices. For example, when the fit between a slide valve spool and its sleeve was .0005 inch minimum, a micronic filter removed all particles capable of jamming the valve. Today the valve must shear such particles because the clearances are such that 3 micron particles might jam it.

• **Three ways dependability will be improved**—First, pilots and other personnel won't have many opportunities to do the wrong thing. Second, there won't be layer on layer of emergency devices. Third, closely related adjustments will be avoided. Particularly those which are only marginally possible. It has been demonstrated many times that deviating from reasonable tolerances is expensive and often dangerous.

▼▼▼

This article was prepared from a paper presented at an SAE Aeronautical meeting by Howard Field, Jr. Consolidated Vultee Aircraft Corporation, San Diego, Calif.

School for Spools



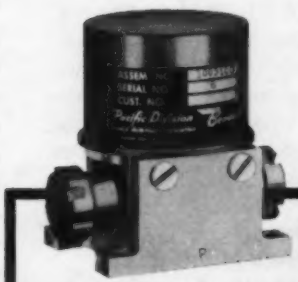
100 power Comparator for checking spool dimensions.

A year ago Pacific Division hydraulic engineers began another development of a new servo valve. Specifications called for *zero to thirty gallons of fluid per minute* yet which permitted a force of only 2 pounds to move the spool—a requirement in advance of the state of the art at that time.

Today Bendix-Pacific engineers have perfected a spool assembly which approaches the performance requirements. To accomplish this achievement more than 50 variations of spools have been designed and tested...and Bendix has increased their wealth of engineering data on flow control characteristics.

When the design goes into production it will require manufacturing within millionths of an inch—a familiar story to Bendix-Pacific where today precision servo valves are built by the thousands with interchangeable linear spool dimensions.

This Company's pioneering achievements in hydraulic engineering and production are responsible today for the leadership which Pacific Division has achieved in the aircraft hydraulics field.



This is the latest Bendix-Pacific High Response Servo Valve Model IX. This valve will deliver 4 GPM at 1500 PSI pressure drop when operating at 8 MA differential current.

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Style No. P-2138—*Neoprene cover,* with sheeting insertion, in 36″ width only, 1/32″ thick and up.

Style No. P-2335—*Buna N cover* with special sheeting insertion. 36″ wide, 1/32″ thick and up.

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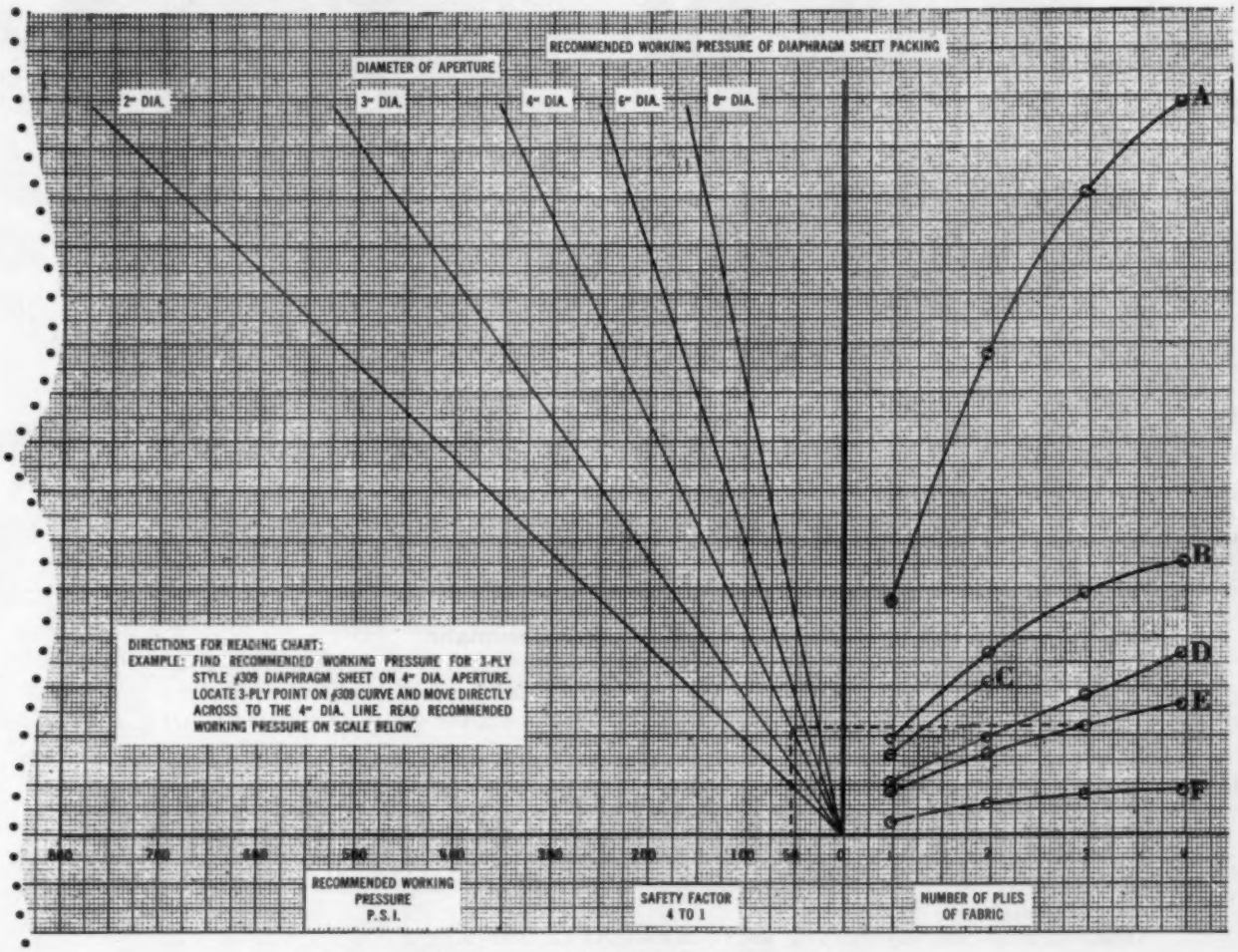
RECOMMENDED WORKING PRESSURE OF DIAPHRAGM SHEET PACKING
DIAMETER OF APERTURE
2" DIA.
3" DIA.
4" DIA.
6" DIA.
8" DIA.
A
B
C
D
E
F
DIRECTIONS FOR READING CHART:
EXAMPLE: FIND RECOMMENDED WORKING PRESSURE FOR 3-PLY STYLE #309 DIAPHRAGM SHEET ON 4" DIA. APERTURE. LOCATE 3-PLY POINT ON #309 CURVE AND MOVE DIRECTLY ACROSS TO THE 4" DIA. LINE. READ RECOMMENDED WORKING PRESSURE ON SCALE BELOW.
RECOMMENDED WORKING PRESSURE P.S.I.
SAFETY FACTOR 4 TO 1
NUMBER OF PLIES OF FABRIC

A. NYLON-P-2902 (CRUDE RUBBER) P-2903 (BUNA N) P-2904 (NEOPRENE)

B. COTTON-P-2139 (CRUDE RUBBER) P-2141 (NEOPRENE)

C. NYLON-P-2339 (CRUDE RUBBER) P-2341 (BUNA N) P-2905 (NEOPRENE)

D. COTTON-#509 (CRUDE RUBBER) P-2133 (NEOPRENE)

E. COTTON-#309 (CRUDE RUBBER) P-2135 (NEOPRENE)

F. COTTON-P-2136 (CRUDE RUBBER) P-2138 (NEOPRENE) 1516-F (CRUDE RUBBER) P-2335 (BUNA N) P-2901 (NEOPRENE)

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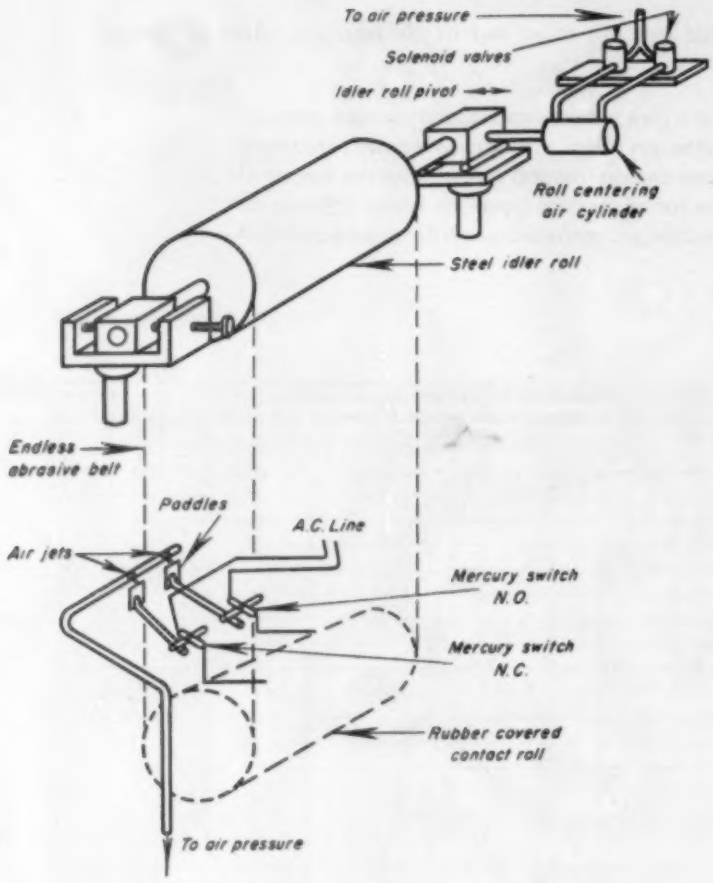

BELT CENTERING SYSTEM CONSISTS of an air sensing unit and a power unit. The endless abrasive belt, running between the lower rubber covered drive roll and the upper steel idler roll, passes between the air jet tube and two brass paddles. When properly centered, the belt interrupts the air jet to the first paddle. The second paddle is being hit by its air jet so that the N.C. mercury switch is held open. If the belt walks to the left the second jet is interrupted to cause the N.O. mercury switch to close. This energizes and shifts one of the solenoid air valves to direct compressed air to power the 3 inch bore 1 inch stroke roll centering cylinder. The cylinder pivots the roll (total roll movement is under ⅛ inch) and the belt walks back to center. With the belt centered, the N.C. switch now opens, the valve is deenergized and a spring mechanism returns the roll and the air pistons to neutral. Should the belt walk to the right, the first jet now hits its paddle to close its mercury switch which causes air cylinder action to pivot the roll in the opposite direction. On the front end of the roll is a manual centering adjustment to initially compensate for a belt which due to manufacturing variations is "long on one side". Initial manual adjustment for this variation keeps the sensing device from operating constantly.

"Here's an error sensing device which has been used effectively for many many years,—combining it with modern pneumatic components and improved mechanical design gives . . .

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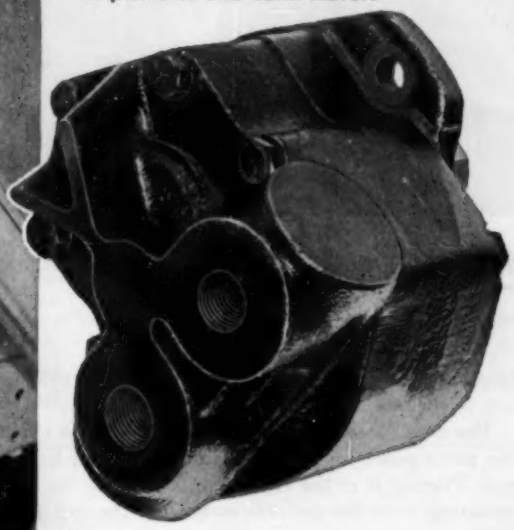
TWO important functions, belt tensioning and centering, are being performed by compressed air on the new giant abrasive belt grinder and polisher developed by The Hill Acme Company.

This new machine is the latest in a series which has been built since about 1932. While many design changes have been made over the years, the basic sensing device for correcting belt position has remained the same. This belt centering problem results from the tendency of an abrasive belt running over pulleys or rolls to "walk" sideways. On belts under a 12 inch width, crowning the roll prevents walking. For greater widths some mechanical means of centering the belt is needed. The layout drawing explains the air jet sensing device which signals an air cylinder to pivot the top roll for belt centering.

Why not do the sensing with an electric eye or a vacuum system? The problem here is dirt and grit. The sensing device is located in a shower of dirt and it must be able to operate continuously without

"It's the WEBSTER Pump that makes our tractor useful"

... said **David A. Milligan,** Sales Vice President, **American Tractor Corporation,** Churubusco, Indiana, makers of TERRATRAC farm implements and earth movers



Model HCS WEBSTER Hydraulic Pump is driven from cam gear on American TERRATRAC

"It saves money for the operator,"

... continued Mr. Milligan.

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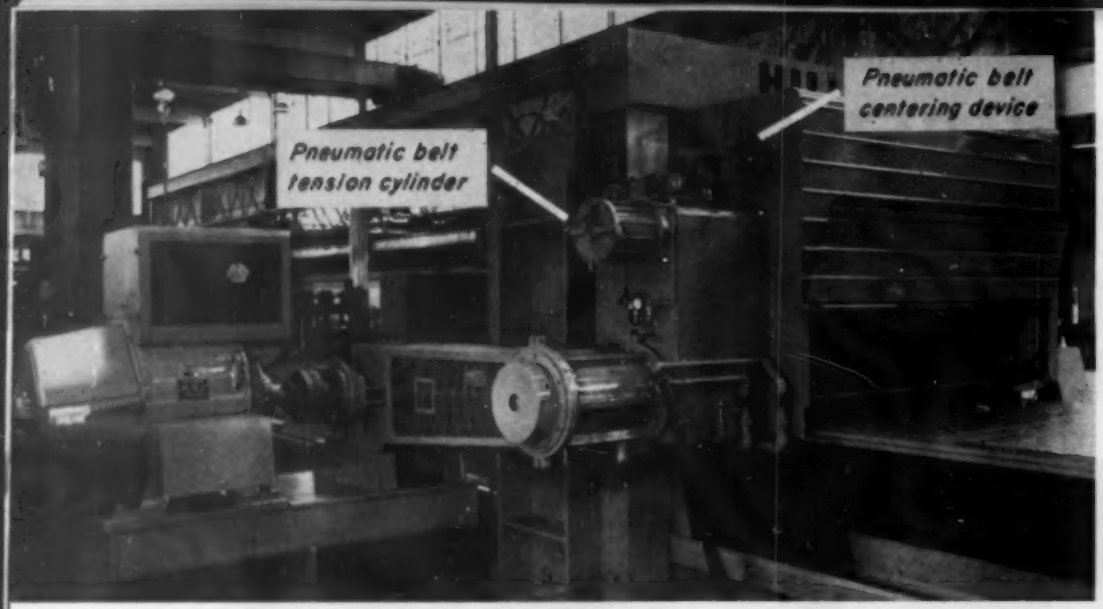


ABRASIVE BELT grinding and polishing machine uses air power to control belt tension and position.

POSITIVE ABRASIVE BELT CONTROL

being affected by the grit. Neither an electric eye nor a vacuum system has proved reliable.

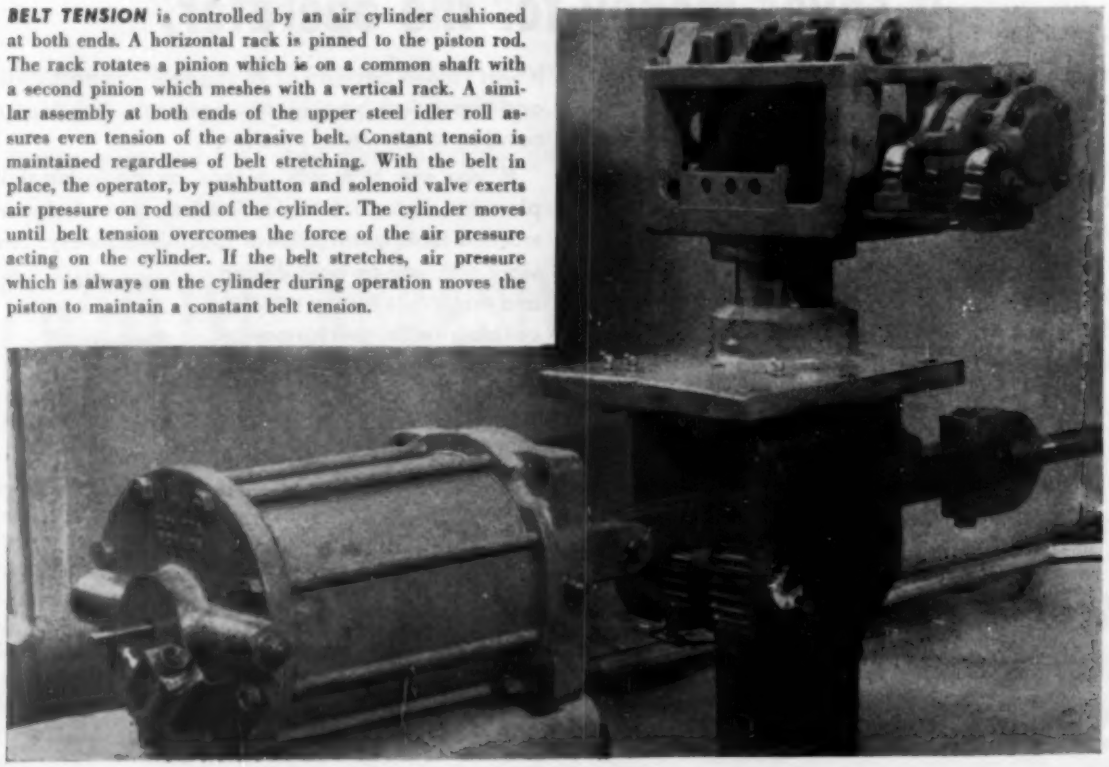
The most recent change in the design was to move the pivot point for the roll from the center to the end. Placing it at the end permits locating the roll centering cylinder and valves outside the grit area behind a separate panel.

To remove and replace abrasive belts and to maintain proper belt tension, an electrically controlled air operated rack and pinion mechanism is used. This system replaced a hand crank device used on earlier polishers and grinders.

These pneumatic devices, being used on the entire line of two roll vertical abrasive belt grinders and polishers, are extremely effective in assuring quality of finish. This quality largely depends on proper belt tension and position.

▼▼▼

BELT TENSION is controlled by an air cylinder cushioned at both ends. A horizontal rack is pinned to the piston rod. The rack rotates a pinion which is on a common shaft with a second pinion which meshes with a vertical rack. A similar assembly at both ends of the upper steel idler roll assures even tension of the abrasive belt. Constant tension is maintained regardless of belt stretching. With the belt in place, the operator, by pushbutton and solenoid valve exerts air pressure on rod end of the cylinder. The cylinder moves until belt tension overcomes the force of the air pressure acting on the cylinder. If the belt stretches, air pressure which is always on the cylinder during operation moves the piston to maintain a constant belt tension.



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TIGHT SYSTEM. Changed annually. Make-up oil added when needed.	**SOLNUS**	Solnus is a quality oil with a long life and a moderate price.
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LEAKY SYSTEM with dilution from water, cutting oil, emulsions and other liquids. Frequent change needed.	**CIRCO**	When frequently changed, Circo gives excellent protection at a low price.
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No one oil can give greatest economy in *all* hydraulic systems. As this chart points out, the condition of the system must be considered. To make sure that the oil you select will give the maximum economy in your particular system, have a talk with your Sun Oil Company representative. Or write Department AH-3.

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Use HYDRAULICS to SIMPLIFY SETUP

Hydraulic cylinders replaced mechanical and air driven designs to provide action which is smooth and powerful.

FIG. 1. TWELVE CYLINDERS are used on this six color press to separate the printing rolls. The "throw-off" is powered through a toggle mechanism. Amount of separation is controlled by mechanically limiting the motion of the toggle which is moved by the hydraulic cylinder.

● By Harold Cassell

IN the design of printing machinery, it is usually necessary to cause a slight separation between the two printing cylinders. Sometimes the plate cylinder is moved, sometimes it is the impression cylinder which is moved. This separation usually takes place while the machine is not in operation. It is used for make-ready on the impression cylinder, plating up for a new job, and for threading the web or paper through the machine. The separation usually does not exceed 1/16 inch in width.

On early machines, the throw-off mechanism which causes the separation was some mechanical means by which the operator had to work by hand. The effort required depended entirely upon the design of the throw-off.

On one or two color machines the operation of the throw-off by hand was not too inconvenient, but as the demand for more colors increased it became more of a task. When the call came for five color machines it was decided to use air cylinder throw-offs. It was found that a lot more pressure was required for this work than was originally thought necessary and larger cylinders had to be used. Several machines were built using air cylinders and although they were better than the manually operated machine, the movement was not as smooth as desired.

Later, orders were received calling for six or eight colors and experiments were made with the idea of using hydraulic cylinders for this work rather than air cylinders. The results were much better, the action was smooth and powerful and in addition the cylinders worked in unison, something we were unable to accomplish with air powered cylinders.

Figure 1 shows the arrangement of Kidder Press Company's six color letterpress with rack back inking mechanism. The photo shows the inking mechanism hooked and locked to the main frame which carries the 6 pairs of plate and impression cylinders. Figure 3 shows the two units separated before they are locked together. Each impression cylinder is connected through linkage to a hydraulic cylinder. This mechanism is duplicated on both sides of the machine so as to obtain a parallel movement when throwing "on" or "off" impression.

Figure 2 shows schematically how the piping is arranged. On this set up the operating buttons perform three functions, all impression cylinders can be thrown on or off individually, the three bottom impression cylinders or the three top impression cylinders, can be thrown on or off independently of each other, or all six impression cylinders can be thrown on or off simultaneously. This is done by the use of solenoid control valves as shown in the diagram. Each end of each impression cylinder carries a load of about 18,000 pounds. The main pump is a vane type constant dis-

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HAROLD CASSELL, *Rotary Press Engineer, Kidder Press Company, Inc., Dover, New Hampshire*

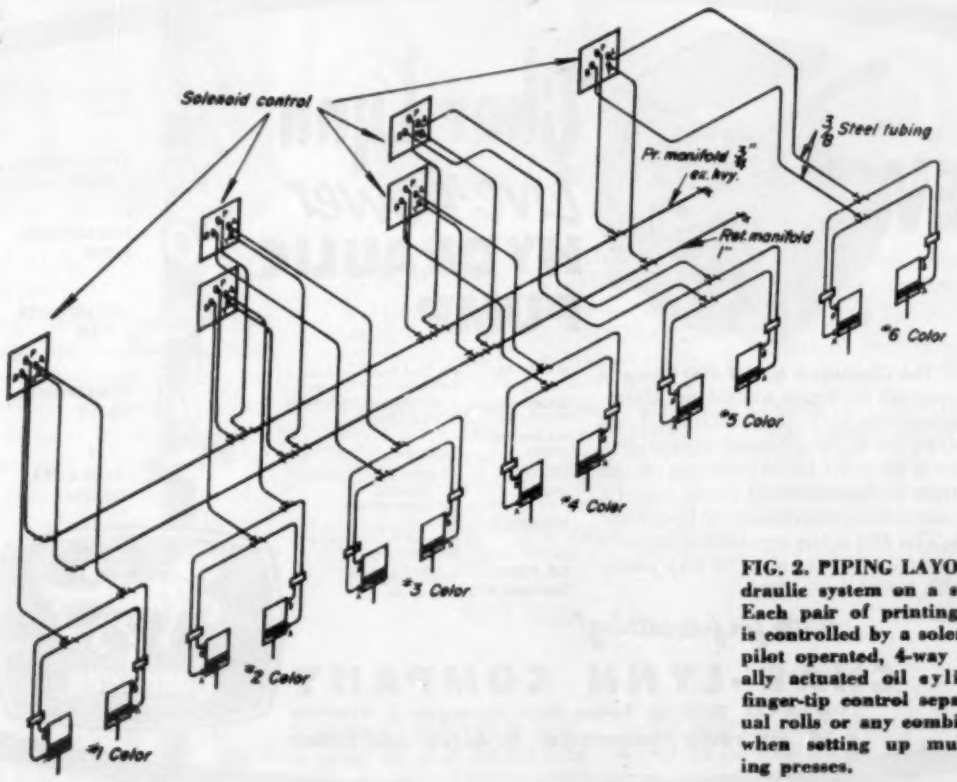

FIG. 2. PIPING LAYOUT for the hydraulic system on a six color press. Each pair of printing roll cylinders is controlled by a solenoid controlled pilot operated, 4-way valve. Electrically actuated oil cylinders permit finger-tip control separating individual rolls or any combination of rolls when setting up multi-color printing presses.

Complex Rotary Printing Presses Use Hydraulics to Simplify Setup

Concluded from page 111

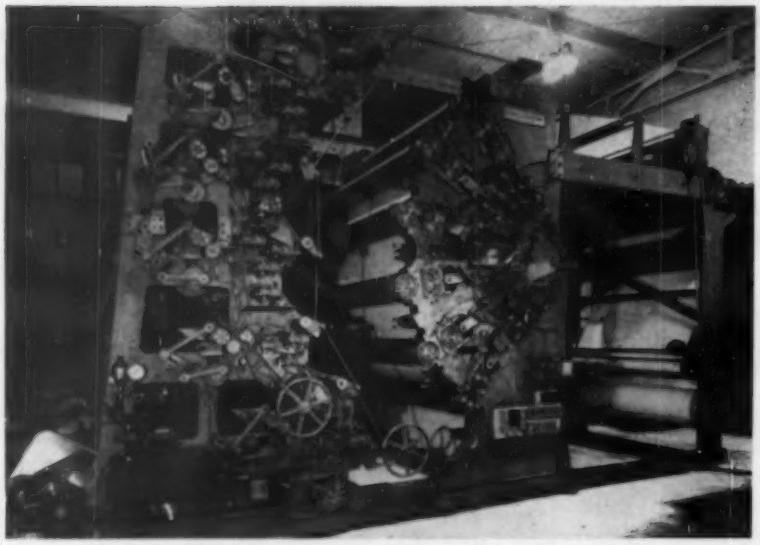

FIG. 3. ARRANGEMENT OF SIX color press with the inking mechanism and main frame separated. The photo shows the operator side of the machine and the six pairs of plate and impression cylinders.

placement, double pump, which consists of a large volume, low pressure unit for moving the pistons over a long stroke, and a small 2 gpm unit which develops 600 psi for holding.

When the machine is in running position, the inking mechanism is hooked to the main frame. This hookup mechanism is also operated hydraulically. The hydraulic cylinders are located on the operator's side of the machine, and through shafts carry 3 pairs of lock-hooks, these are carried on the movable unit and lock back into latches on the stationary unit. It is a simple mechanism and is operated by one rotary control valve. The pump operates at about 300 psi pressure and about 1800 pounds is exerted on each pair of hooks.

The small hydraulic pumping unit on the lower left corner of the ink unit frame supplies oil pressure for the lock-hooks only. It is equipped with an accumulator which assures locking pressure.

Hydraulic power has reduced the time required for press set-up and has greatly reduced operator fatigue. Effortless pushbutton control has replaced handwheels. ▼▼▼

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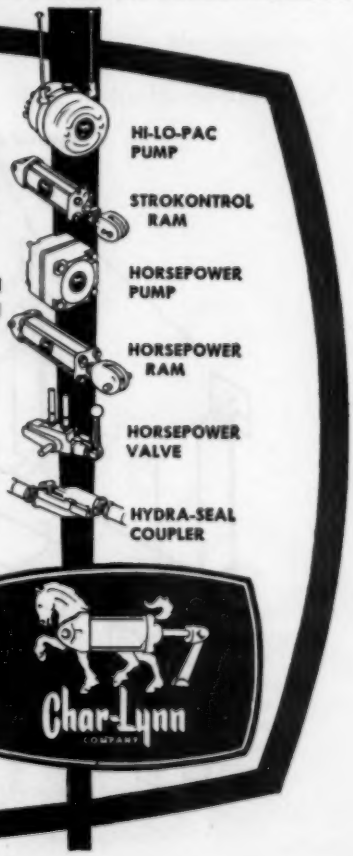

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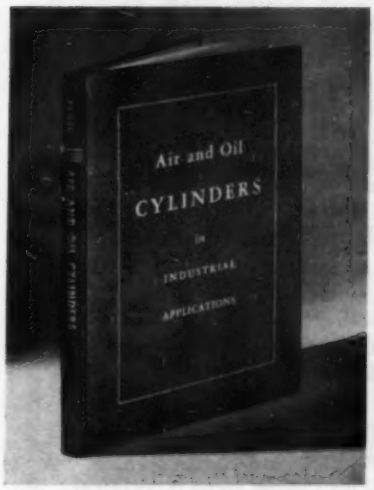

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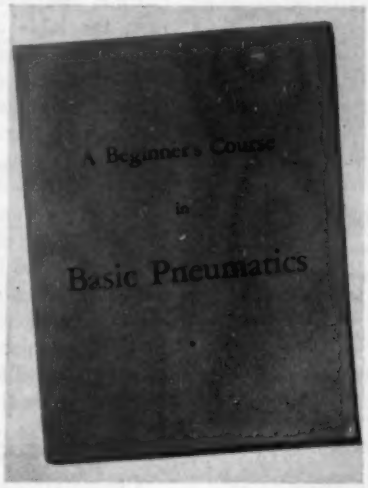

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Radial Contours With Tracer Control

Continued from page 59

sure inlet of the servo tracer valve, and is maintained at a constant pressure by the pump relief valve. The back end of the cylinder is connected through retract valve to the control port of the tracer valve. The remaining port on the tracer valve is the "bleed-off" port where a slight back pressure is maintained.

The tracer valve stylus is hydraulically a relatively fixed point. After retraction of the table assembly it reestablishes contact with the cam again at this fixed point. Thus, as the rotary feed progresses, the variable radial contour of the cam is converted to the correct positioning of the table assembly. This is accomplished by metering oil out of the back end of the cylinder until the opposing forces in the cylinder are balanced by the cam contacting the stylus and pushing the tracer valve spool to a "shut-off" point.

Upon completion of the cutting stroke of the ram, the table assembly is retracted. This is accomplished by retract solenoid valve being deenergized and shifted by pressure switch action to introduce full pressure to the back end of the cylinder. Because the retract stroke must necessarily be very short, an instant later, a limit switch energizes stop valve and also energizes retract valve to open the cylinder back end to tank. Now the pressure is cut off from both ends of the cylinder and the table assembly stops. Upon completion of the ram return stroke, the pressure switch deenergizes stop valve to reestablish tracer control. Throttle valves are used to slow the speed of table assembly movement for quick stopping and also to prevent "overshooting" of the tracer valve.

HYDRAULIC CIRCUIT FOR CAM CUTTING

Circuit arrangement for cutting cams is identical to the circuit for work cutting with the following exceptions: Positioning of the table assembly for cam cutting is accomplished by metering oil into the back end of the cylinder. When the work master contacts the stylus and pulls the tracer valve spool to a "shut-off" point, equal forces are established in both ends of cylinder. Table assembly retraction is in the opposite direction but is again accomplished by retract valve.

PRESSURES AND ACCURACY

The stylus is maintained in contact with the master by light spring pressure on the order of 1½ to 2 pounds. The tracer system operates on a unit pressure of 500 psi with a back pressure of approximately 60 psi. A maximum holding force of 4000 pounds is available to offset the side thrust of the cutting tool. Accuracy of duplicating to plus or minus .002 inch is obtained on internal contours having a mean diameter of approximately 20 inches.

▼▼▼

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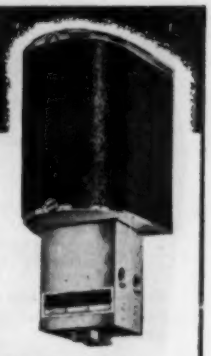

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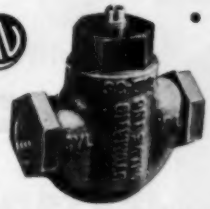

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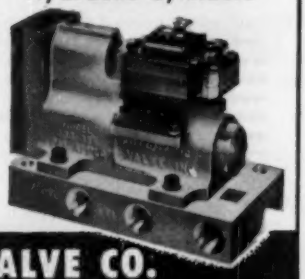

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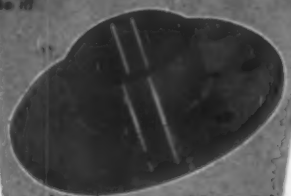

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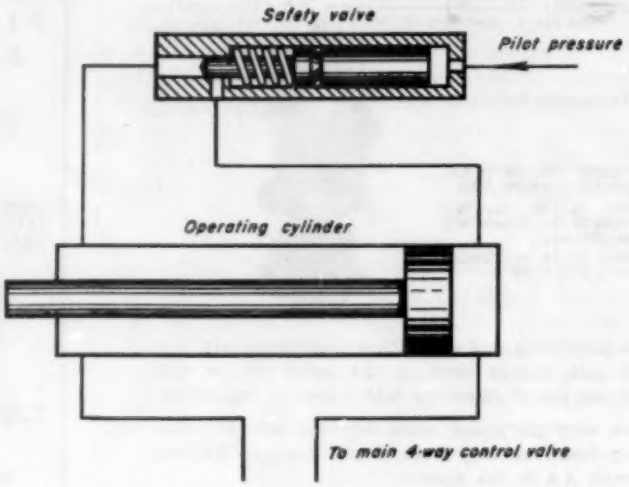

SAFETY VALVE opens when pilot pressure falls.

What Happens When the POWER FAILS?

POWER failure does happen. Will your hydraulic machine "fail-safe"? For every phase of operation the designer must ask, "What will happen to the tools, the work, the operator and the machine if oil pressure failed at this instant?" Each machine requires careful study.

The drawing, above, shows one answer to that question on a special machine. If your circuit has similar conditions, it's an idea you might consider. On this machine, the operating cylinder had to be controlled by a solenoid operated closed center three position valve. When the valve was put in neutral, the cylinder was locked between columns of oil. This was necessary during the operating cycle. However, during one point in the cycle, with the workpiece in the machine, if power failure caused machine shut down, the locked cylinder would result in damage to the work. To prevent this possibility, a safety valve which operates from a pilot pump already used in the circuit was installed. When pilot pump pressure is greater than the spring force in the safety valve, the valve is held closed. Failure of pump pressure causes this safety valve to open. This opens the oil line between both ends of the cylinder to result in a "floating" cylinder which can be easily moved. Pilot pressure acting on the large area of the safety valve is great enough to hold the valve closed when main oil pressure is on the operating cylinder rod end. ▼▼▼

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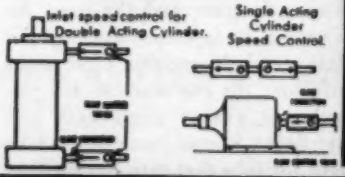

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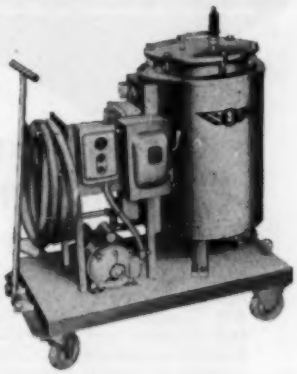

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Machines Requiring Special Pressure

The Cornelius Air Compressor can service individual machines requiring any accumulator pressure up to 3000 pounds per square inch. It is simple and economical to operate.

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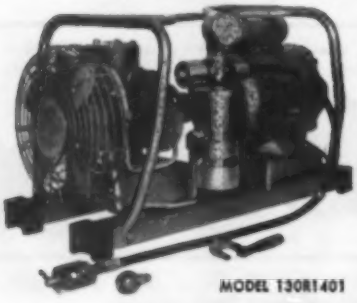
PORTABLE AIR COMPRESSORS

For Pressurizing Hydraulic Accumulators and Air Cushions



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Two basic models with capacity of 0.6 to 2 SCFM and pressures to 3000 pounds per square inch. Largest model weighs less than 60 pounds complete with electric motor. All standard motor windings available.

We invite your inquiry. Ask for Product Sheet No. 5

THE CORNELIUS COMPANY

560 39th Avenue N. E.
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Ideas from a Sales Engineer

Elmer F. Heiser

Elmer Heiser, who is associated with S. G. Morris in Cleveland, has spent 18 years selling air and hydraulic components to industries in northern Ohio. During these years he has encountered innumerable situations, many of which he says "relate to fluid power, people and problems". We've asked Elmer to tell you about them in a monthly column. He is the author of the recently published *"Air and Oil Cylinders for Industrial Applications"*. We're sure that you will find valuable this opportunity to borrow from Elmer's experiences—which he treats amusingly in both words and cartoon.

When is an expert a bum?

THIS is written by one who for a good many years has been a peddler of air and hydraulic equipment. To be on firm ground, the dictionary was consulted for the definition of "peddle". The word "peddle" is described as follows: "to travel about with wares for sale." While the definition does not contain the dignity we naturally might expect with our activity, it may for general purposes be acceptable. There was a further definition which I chose to ignore: "to do a small business; to be busy about trifles". Along about here it began to look like the term peddler was the wrong word to cover the "work" we do in this field. Before slamming the cover down, my eye ran to the next word "peddling". It would seem that a peddler would do peddling but here's what the dictionary says: "petty, insignificant, piddling".

Perhaps we should start over. This is now being written by a technical representative who for years has specialized in the field of fluid power equipment. You are of course free to use any word or series of words to describe such activity but you know in advance that no attempt at hoodwinking will be made.

You might be interested in learning that we frequently shift from expert to bum and back again within very short periods of time. Funny thing too. In one place, two dozen words and you're a bum with little disagreement on either side. In the next place, with another two dozen words (maybe even the same ones) and you're regarded as an authority and an expert just as you suspected all the time.

What does a salesman of this sort of equipment do for a living? The opinion you get depends on who answers the question. As the bum in the preceding paragraph, he's the one whom you believe messes up otherwise clear transactions between the manufacturer and the user. As the expert, he is unquestionably the shining and dependable light amid confusion; the guy who can tell you whether it will or won't work and why. Being human, we like to take credit for jobs that turn out successfully and can usually find someone

Continued on page 122

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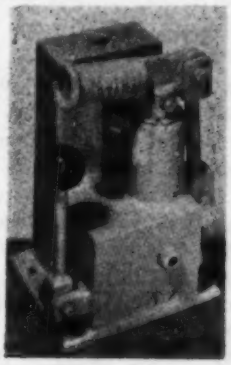
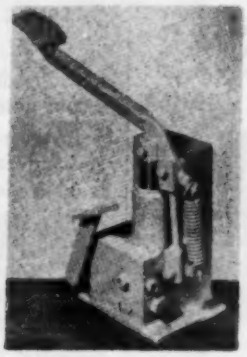
STAR Hi-Lo TWO SPEED CONCENTRIC PUMPS





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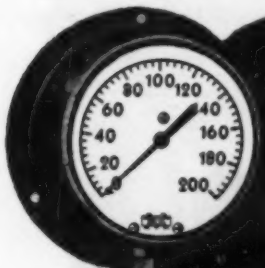

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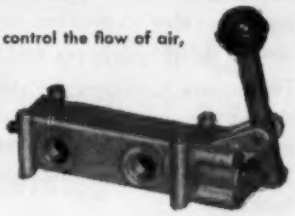

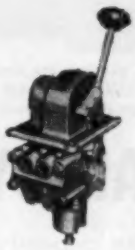

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PLUG-IN COUPLERS. These are full-flow, heavy-duty, quick couplers available in two series: Interchange (for use with other makes) and Standard. Both are made in the Push Type, one hand connect-disconnect, and the Sleeve Type.

SAVAIR® COCKS for on-off control of air, water, oil, or gas. Two, three, or four-way operation. Pipe sizes ¼" to 2". Self compensating for wear. The best cock on the market.

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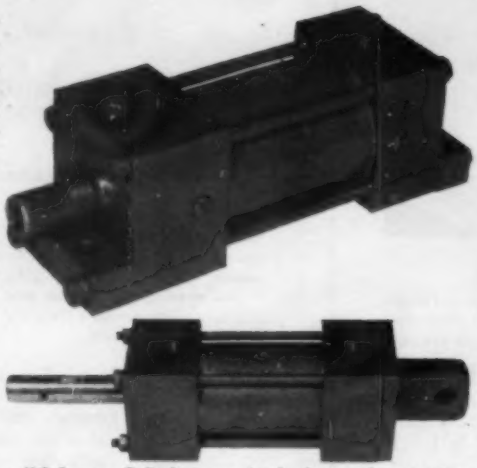
The Square Cylinders are designed for low and medium pressure air and oil service, 250 psi pneumatic, 500 psi hydraulic.

MEETS J. I. C. STANDARDS



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Ideas from a Sales Engineer

Continued

to blame for those that wind up on a sour note.

In the process of getting customers and factories into and out of trouble the salesman meets a lot of people with a wide range of ideas. He bumps into all kinds of problems and frequently works quite closely on some foxy ones as the bugs are exterminated. You can see that he is regularly exposed to progress, know-how and experience, some of which must rub off or stick on.

For example, the other day I had occasion to visit a laboratory where a three year old hydraulic press was acting up by emitting a miserable chatter every time it closed. We ran the press up and down a few times in an understanding and analytical manner and then shut the pump off to figure things out. That's standard procedure when you don't know for sure. Anyway, we narrowed the trouble down to two reasonable possibilities, then proceeded with the wrong one first. Enough time had elapsed during the heavy diagnostic

Who started the **??..ll pumps?

session so that we forgot the press itself in our pursuit of system difficulties. We unscrewed the logical port of the most logical (but blameless) element and promptly found ourselves in trouble. It seems that in our eagerness to get to the heart of the problem we left the up-coming ram in the raised position, full of oil. The

Continued on page 122

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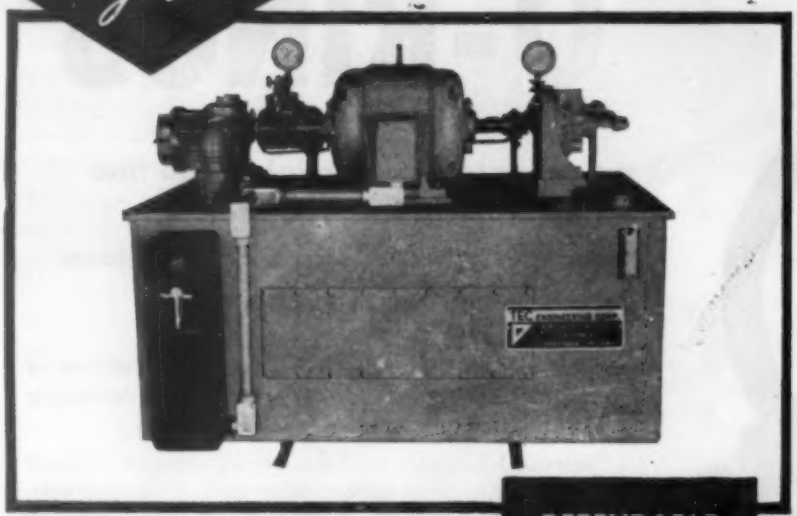
Another ROPER on the job



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SIZES 1 TO 300 G.P.M.
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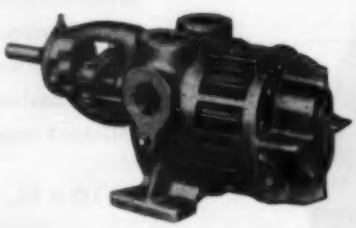
ROPER PROVIDES HIGH-SPEED IN DRAW PRESS FOR MOVING MATERIAL INTO PLACE

Shown above is an integral part of a draw-press used in the manufacture of kitchen cabinets. This custom-made power unit has to satisfy the requirements of high speed for positioning materials plus high pressure for the actual draw. Tec Engineering Corp., Logansport, Indiana solved the problem of design and engineering with a 75 g.p.m. low pressure Roper Rotary Pump for the positioning and a 3 g.p.m. radial piston pump to supply 3500 p.s.i. for the draw.



PERHAPS YOU HAVE AN APPLICATION THAT CALLS FOR . . .

This example is typical of Roper adaptability to a given "assignment." If you have a problem involving a special application or if you require a pump for replacement, you can count on Roper to do the job dependably. Write for bulletins on the complete Roper line or call your nearest Roper representative.

ROPER Rotary Pumps

GEO D. ROPER CORPORATION
703 Blackhawk Park Avenue
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part we unscrewed had a spring behind it, which chose the occasion to jam crosswise in the hole.

There we were, with an unpluggable hole cascading oil from the ram and no way to get the plug back in against the cocked spring. Unfortunately the dump valve for the ram was pilot operated and as we didn't want to add pump displacement to our sudden problem we had no pilot pressure to release the oil in the ram.

BEAKER BRIGADE

Even such a bad situation has its amusing aspects. Since this was in a chemical lab, the only handy containers were glass beakers. We started to fill these by thumbing the stream of oil to guide it into the beakers. The beaker brigade between fountain and reservoir was quickly simplified by sticking a glass funnel into one end of a hose with the other end of the hose stuck in the filler hole in the tank.

A more slimy, slippery, gooey, more ludicrous mess I never did see. We did figure out that by removing the pilot connection to the dump valve we could shift the valve with a rod through the port but we didn't empty the ram this way until things were messed up.

What was the trouble? Nothing more than a pilot line to a sequence valve which was not connected into the system properly. You probably conclude that this account proves the truth of earlier statements about how easily one can become a bum. Think what you will. However, the foolhardiness of uncorking parts of a system while under load has never been better demonstrated by any experts.

Doesn't the ability to teach a lesson so dramatically come close to the "expert" category? A real expert though probably could answer one annoying question. Why should a hydraulic system, improperly connected three years ago, work reasonably well until now?

▼▼▼

Next Month:
Should it be air or oil?

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The Biggest PLUS VALUE in Cylinders

For hydraulic pressures up to 1500 or 3000 p.s.i.

They're sturdy—dependable—economical

Use the hydraulic cylinder that will always give you plus performance in your equipment. Designed and constructed to J.I.C. standards, NEPTUNE-POWER PLUS cylinders are available in seven standard mountings—series 1500 for oil and water pressures to 1500 p.s.i.—series 3-1500 for pressures to 3000 p.s.i.

- **Bores from 1 to 24 inches —Strokes to 18 feet.**
- **Pressure ring design permits head rotation to any pipe location.**
- **Precision fitted piston rings prevent by-pass while offering minimum friction.**
- **One piece high pressure, self-adjusting, rod packing provides precision bearing and guide for piston rod.**
- **Single or double end rods, with cushion.**
- **Other series available for air pressure.**

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Always the best of the better gauges, Mastergauge has been given *plus* features that further lengthen its lead.

A still better tube construction: Socket, tube and end piece are now all fused into *one* leak-tight unit by the new Marsh "Conoweld" process.

A still better case: New copper clad wrought steel "Marshalloy" case has the corrosion resistance of pure copper; weighs one third as much as cast iron, and is *four times* as strong.

An even finer movement: Further refinements are added to the rugged, corrosion resistant, virtually frictionless stainless steel and monel Mastergauge movement. A typical refinement is the "coined" (extruded) sector gear which contributes extra strength and precision.

Where only the best is good enough—in the most critical industrial refinery and oil country services —"Mastergauge" is your instrument.

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PALMETTO O-RING—A popular seal for low and medium pressures. Simplifies design—saves space. Also recommended for gasket applications.

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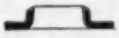

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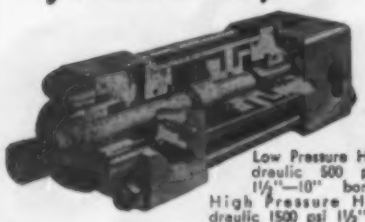

Low Pressure Hydraulic 500 psi 1½"—10" bores
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Air 200 psi 1½"—10" bores. 42 page catalog

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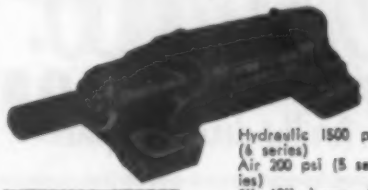

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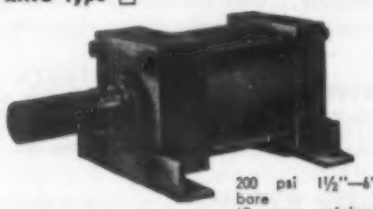

200 psi 1½"—4" bore
12 page catalog

AUTOMOTIVE *Heavy Duty Air* ☐

BOOSTERS • TANKS-CYLINDERS ☐
Boosters, Drive Cylinders 4", 5", 6", 8" bore. Ratios 5:1 to 28.5:1.
Air-Oil Tanks 4"—10" bore sizes. 8 page catalog

Indicate the catalog or catalogs you desire or if you want the complete file ask for 92 pages of Hydraulic-Pneumatic engineering data and specifications.

PETCH MANUFACTURING COMPANY
Alpena, Michigan
Sales Office 461 York, Detroit 2, Michigan.

Here's a report about the recent JIC meeting at which the Pneumatic Standards were revised.

What's New About JIC Pneumatic Standards?

YOUR copy of the JIC Pneumatic Standards, which probably has the date of September, 1950 on it, was revised recently at a meeting in Detroit. New revised copies of the standards will be prepared. You can request a copy from: Joint Industry Conference, Box 182, North End Station, Detroit 2, Michigan.

Principal changes agreed upon were on the terminology of diagrams (to coordinate with the soon to be published ASA Hydraulic and Pneumatic-Component Symbols) and on operation, control and servicing of solenoid operated valves. A number of the changes accepted were minor and consisted of rewriting for clarification. Some paragraphs were dropped and some new ones added.

• **Circuit diagrams**—a drawing using standard symbols will now be known as a Graphical Diagram instead of symbolic. A drawing showing functional construction is a Cutaway Diagram instead of schematic. Three new symbols were accepted: one for a flexible line, the second for a passing line and the third for a rotating shaft.

The revised standards no longer specify diagram size. The drawing should be big enough to show all components. Whether your diagram is Graphical or Cutaway it will have to be in agreement with ASA Hydraulic and Pneumatic Component Symbols.

• **Problems for the machine builder**—According to the revised standards, if a machine builder wants to deviate from the standards, he will need the purchaser's approval in writing. On the machine, he will have to mount a tag next to each pneumatic device which permanently identifies the device with the same identification, shown on the circuit diagram. If the tag can't be mounted next to the component, it should be attached to the pipe or tubing to which the component is connected.

When practicable, pneumatic controls should be mounted a minimum of two feet and a maximum of seven feet above the working floor level.

• **Solenoid operated valves**—A new section, A 2.5.8, was added to cover the the design and operating features of solenoid valves. To comply with this section, the valve manufacturer will have to supply a solenoid enclosure which prevents entrance of contamination and must be high enough to hold 6 inch taped pig-tailed leads. (This eliminates the need for a separate junction box.) The standards now call for ring type pressure connectors on pig-tail leads, threaded electrical conduit connections, and captive type screws for retaining the cover.

To help solve solenoid valve failure problems, some means of preventing loss of the solenoid enclosure must be provided. Also

Continued on page 128

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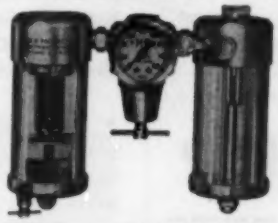
3 in 1 GUARD of the AIR LINE

M·B

WHIRL-A-WAY
FILTER-REGULATOR
and
LUBRICATOR ASSEMBLY
MODEL W-3

the BEST PROTECTION TO YOUR AIR-VALVES, CYLINDERS, PNEUMATIC TOOLS, ETC.



The FILTER removes solids .00039 and larger. TRANSPARENT BOWL provides visibility. REGULATOR capable of passing large volume with unrestricted flow and minimum pressure drop. LUBRICATOR delivers desired volume of oil. Bowl can be refilled without shutting off air supply.

ANY OF THESE 3 DEVICES CAN BE USED AS SEPARATE UNITS OR IN ANY COMBINATION

WRITE FOR LITERATURE

Visit our Booth 909, A.S.T.E. Tool Show Los Angeles, March 14-18

M·B PRODUCTS
46 VICTOR AVE., Div. 10
DETROIT 3, MICHIGAN

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For Industrial Use—

This or This?

OPEN JOINT PERMITS A STREAK OF DIRT AT JOINT OPENING

"CJ" WIPER'S CLOSED JOINT KEEPS THE ENTIRE ROD CLEAN

For these dry operations requiring absolute freedom from dust or dirt passing through joint of ring to bearings or packings, we have especially designed—the

FALL WIPER RING with Closed Joint

(our P/N-FWR-CJ)

In addition to the above, and since 1944, we have also manufactured **For Army and Navy Use** the 3 Piece **FALL WIPER RING FWR-3C**

Spec. Mil-S-5049, AN Approved, Military part numbers from AN6231A1, ½", to AN6231A71, 13", diameter. This ring consists of 3 pieces assembled into one . . (1) a one-piece Split Wiper Ring (Body) with 2 flanges or groove in its O.D.; (2) a one-piece split compressor spring assembled in groove (3) and endless cover band surrounding spring in groove which causes squeeze grip action on piston rod.

Squeeze Grip Action Does It—patented

—and squeeze grip is always the same because uniform tension of spring under endless cover band. Rods or pistons do not stick or become immobile in ANY temperature.

Our engineers will gladly work with you on any wiper ring problem. Write, wire or phone us.

Ace Products Co., Toledo 1, Ohio

Fall Wiper Ring SPRING LOADED

Phone Adams 0513

Covered by patents issued and patents pending.

A New Gresen Product

DIFFERENTIAL RELIEF VALVE

Of Greater Capacity

Model D75

The Quality Valve At Mass Production Prices.

Features

- ★ Grey Cast Iron Body
- ★ Hardened Steel Plunger and Seat
- ★ Smooth Operating Pressure Regulating Screw
- ★ Light Spring Has Long Life and Low Stress

Pressure Range: 50 to 1250 P.S.I.
Capacity: 24 G.P.M. @ 15 ft/sec

Relief valve of smaller capacity available in our Model DR75.

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Is Delivery A Problem?

WE HAVE HYDRAULIC POWER ON THE SHELF

Our inventory includes a wide variety of pumps, valves and controls to satisfy your needs immediately. Pumps from 1000-3000 PSI 1½—100 G P M. 4 - way valves, ⅛—3 NPT relief valves, check valves, to complete any circuit in a hurry. JIC standard 20-30-60 gallon tanks in stock.

Package power units designed for your specific needs in accordance with JIC standards.

ST.

Write for Free Catalog Today!

St. Lawrence Hydraulic Co. Inc.

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Revised JIC Pneumatic Standards

Concluded from page 124

the user must be able to manually operate the valve without removing the enclosure. As a safety measure, the valve must be electrically inoperative when the solenoid cover is removed.

• **Compressors**—When compressors are piped in parallel, a new standard requires that valves be provided to permit removal of any compressor while other compressors are still in operation. Another new addition is the requirement of adequate seals when there is piping run into the compressor compartment from another compartment which does not meet compressor compartment requirements. Compressor compartment requirements are noted in your present standards. They call for a clean, vented, moisture free design.

• **Accessories**—Separators have been added to the section covering filters and lubricators. The standards now instruct the builder to install filters and separators as close as possible to the unit being protected and be readily accessible for servicing. And, when practicable, suitable water dump traps shall be installed.

• **Packings**—Emphasis is being placed on the use of pressure sealing type of packings. Because users have often been faced with an identification problem whenever a packing needs replacement, the new standards detail the means of assigning part numbers.

• **Easier maintenance**—This is a major goal of the standards. To further reduce machine down time, the new standards add greater emphasis to accessibility for servicing of cylinders. Although the standards do not recommend the use of integrally cast cylinders, when they are used, all parts subject to wear or damage must be easily replaceable. Protection of the operator is another goal of the standards. To increase this protection, exhaust mufflers are recommended along with deflectors located to protect operators from air blown particles.

For storage and surge tanks, the new standards now indicate that where no state or local regulations exist for constructing the tank, ASME Code for unfired pressure vessels should be followed. Unless otherwise specified the tank should be designed for a working pressure of 125 psi.

• **What was accomplished?**—Reviewing these revised standards shows the effort of the machine user to get the component manufacturer and machine builder to provide a pneumatic machine which is dependable, safe and easy to maintain. Most affected by the new revisions are the valve manufacturers. Many of them will have to redesign their valves to meet these standards. ▼▼▼

HIGH PRESSURE PUMP

air driven... for pressures to 30,000 psi

Use for hydraulic presses and other hydraulic machines for clamping, riveting, crimping, shearing and punching. Applicable also for hydrostatic testing and other high-pressure, low-volume service.

• Boost 100 PSI. air pressure to 10,000 PSI. fluid pressure for $173.25 (FOB Gardena, Calif.). Eight standard models as listed in table. Special models for lower or higher pressures. Applicable wherever low-volume output at high pressures is the requirement. For oil or water service. Complete power packages also available. Send for bulletins.

Model No.	Maximum Input Air Pressure	Nominal Ratio	Discharge Pressure at 100 PSI. Input Air Pressure	Prices, F.O.B. Gardena, Calif.
S-216-C- 10	150 PSI	10:1	1,100 PSI	$220.00
S-216-C- 20	150 PSI	20:1	2,100 PSI	210.00
S-216-C- 35	150 PSI	35:1	4,600 PSI	173.25
S-216-C- 60	150 PSI	60:1	6,600 PSI	173.25
S-216-C-100	150 PSI	100:1	8,800 PSI	173.25
S-216-C-150	150 PSI	150:1	15,200 PSI	194.50
S-216-C-200	150 PSI	200:1	23,750 PSI	225.00
S-216-C-300	100 PSI	300:1	33,500 PSI	289.50

SPRAGUE *Engineering Corporation*

1144 WEST 135TH STREET, GARDENA, CALIFORNIA

New Products continued

PRESSURE PICKUP

. . . ¼ inch diaphragm

Designation: Dynisco

Features: Flush mounting of the pressure-sensitive diaphragm leaves flow undisturbed and eliminates need for pressure-connecting tubes. New pickup can be mounted in a 5/16—24 threaded hole. Unit is particularly suitable for studies in

high pressure hydraulic and pneumatic systems. Compact overall size of pickups permits several units to be mounted close together for pressure differential measurements.

Sizes: Units are available to cover pressure ranges of 0-300 psi, 0-500 psi, 0-1000 psi, 0-2000 psi, 0-3000 psi, 0-5000 psi and 0-7000 psi.

Dynamic Instrument Company, Inc.
Cambridge, Massachusetts

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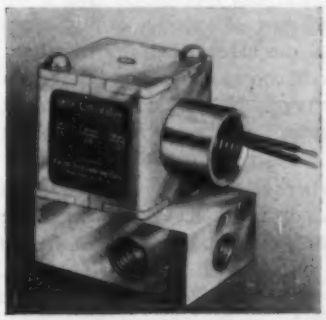
4-WAY SOLENOID VALVE

. . . of simple design

Design: Valve has floating seal design with one sealing surface which



is self-cleaning. This unit has a single coil and fewer parts.

Features: Valve is positive acting even with heavy contaminent conditions. By providing a constant wiping action, contaminents cannot interfere with its normal operation.

Specifications: Available with conduit or standard fittings, ¼ inch NPT pipe connections, 115 Volt AC continuous duty, it has 10 watt power consumption.

Applications: Recommended for use with air and hydraulic oils.

Valcor Engineering Corp.
Kenilworth, New Jersey

Fill in No. 226 on Reader Service Card

OIL & MOISTURE SEPARATOR

. . . has transparent cylinder

Designation: Model 65 C

Features: Designed for use on compressed air lines up to 250 psi. The new clear-view unit is 2½

inches in diameter and 12 inches long. Approximate cleaning capacity of the two silk encased filters before needing replacement is a million cubic feet. Transparent cylinder shows when filter elements should be replaced or when mois-

Continued on next page

Modernair

MV CONTROL VALVES

Easier to apply . . .

Compact, versatile; choice of 3 mountings and 7 manual, solenoid, cam or pilot operating means for pneumatic, hydraulic systems to 200 p.s.i.

Easier to install . . .

Sub-base, console and panel, or conventional piped mountings available. Made in ⅜", ½", ¾" and 1" NPT port sizes.

Easier to service . . .

Only moving part is one-piece spool carrying all moving seals which are standard "O" rings stocked by industrial supply houses; replaceable in minutes—no springs or retainers.

4-way double solenoid MV is only 9¾" x 3½" x 2⅝" overall (½" NPT ports); handles to 150 p.s.i.

Lever-operated MV valve body with ½" NPT ports is only 4" x 3½" x 2⅝". Handles to 200 p.s.i.

Don't lose time and money with misfits or specials when a stock MODERNAIR MV valve will do your job. Modernair valves, cylinders and parts are stocked in principal U.S. and Canadian cities, and at factory. For prompt delivery, call your authorized dealer or write us now for specifications and prices.

1

Modernair CORPORATION
TRADEMARK

ROOM 3-A, 400 PREDA ST. • SAN LEANDRO, CALIF.

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Fill in No. 26 on Reader Service Card

What he needs is a STAFFA HYDRAULIC RAM!

Staffa Rams are available in four standard ranges: high and low pressure solid, high pressure hollow and tubby rams. Loads from 1 to 150 tons. Pressures up to 5,000 p.s.i., strokes up to 36". Higher pressure and larger stroke rams are made specially.

For rams, pumps and all other hydraulic equipment write to Chamberlain Industries Ltd. Staffa Works, Staffa Road, Leyton, London, E.10.

Staffa

For pulling, pushing, lifting, pressing, clamping, bending or spreading.

CHAMBERLAIN INDUSTRIES LTD.

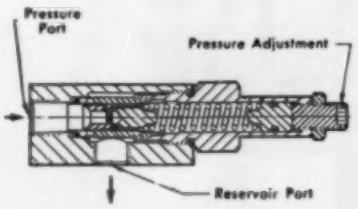
Staffa Works, Staffa Road,
Leyton, London, E.10, England.
Telephone: LEYtonstone 3678.

NEW! Relief Valve For Low Pressure 10 To 500 P.S.I. Oil

Designed For Continuous Operation

For systems where pressure is regulated by spilling over the relief valve.

- **Long Life—hardened steel parts**
- **Quiet—no chatter or rumble**
- **Dependable—will not stick open**



Write or phone Mentor, Ohio, Blackburn 5-2625 for complete specifications.

Fluid Controls, inc.

Manufacturers of Hydraulic Valves and Devices

Relief Valves • Check Valves • Restrictor Valves
Needle Valves • Pilot Check Valves • Special Valves
Pressure Compensated Flow Regulators

1284 N. CENTER STREET • MENTOR, OHIO

New Products / continued

ture should be drained from bottom of the separator.

Construction: Unit has drop-forged ends, quarter inch intake and outlet connections. Gauge and regulator equipment are optional.

Beach Precision Parts Co.
Boonton, New Jersey

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LIMIT SWITCH
. . . for machine circuits

Designation: Type DM

Design: Electrical side: heavy one-piece molded insulating chamber and terminal block surrounds all live parts, supports wiring terminals and shrouds moving contact arm to prevent fouling by wire leads. Areas subjected to arc deterioration are protected by non-carbonizing glass melamine plates. Contacts are heavy fine silver which minimizes contact failure. Mechanical side: case is heavy

die cast construction, wall between electrical and mechanical side is integral part of casting. Sturdy overtravel mechanism permits switch to operate continuously with 30 degrees overtravel. Heavy double-concentric overtravel springs are in compression for fail-safe operation.

Features: Standard switch can be fitted with choice of 8 operating levers and 6 mounting plates. Levers can be adjusted over a wide range. All latch and trip bearing surfaces are nylon to steel. Units are available with ½ or ¾ inch conduit opening.

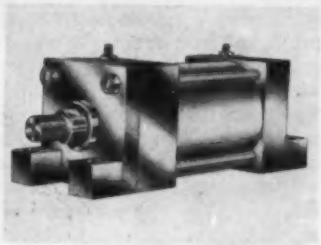
The Clark Controller Company
Cleveland, Ohio

Fill in No. 228 on Reader Service Card

NEW CYLINDER MOUNTING
. . . saves space

Designation: Model 77

Features: This model supersedes the company's model 71. Sturdy, thick, square mounting lugs are easily and quickly installed and detachable for convenient interchangeability. Its centerline height is precision ma-



chined to a tolerance of .002 inch. This mounting is inherently stronger because its mounting loads are concentrated closer to the centerline of the cylinder, thus reducing beam action. The model is for side or foot mounting, is available in all bore and stroke sizes.

Miller Fluid Power Company
Melrose Park, Illinois

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Continued on next page

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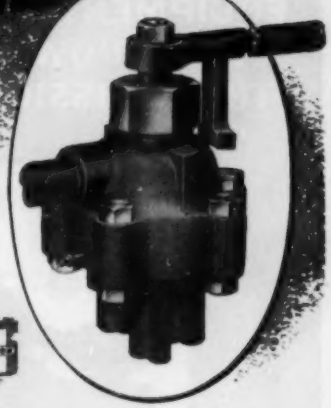
NICHOLSON
VALVES
for Air & Fluid Power



Solenoid, Motor, Lever, Foot Types for Every Medium

Nicholson furnishes valves for cylinder control, distributing, metering and for many special operating cycles. Installations in a wide range of industries have been in constant service for well over 25 years. In addition to their long wear and minimum maintenance, Nicholson valves feature: specially treated hard seats and lapping flat discs which actually become tighter with use; choice of 6 metal combinations to suit your specific service; positive protection against grit. Size, ⅛" to 2½". Pressures to 5000 lbs.

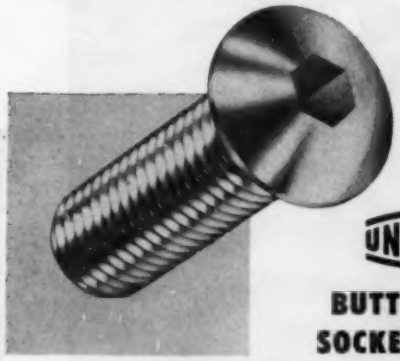
Send for Catalog

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

213 Oregon Street, Wilkes-Barre, Pa.

save with standard



UNBRAKO

BUTTON HEAD SOCKET SCREWS

BUTTON HEAD FEATURES

- designed for applications where countersinking is not practicable
- heat treated alloy steel for strength
- low head height for streamlining designs
- accurate hex sockets for nonslip drive and freedom from marred heads or mutilated work
- fully formed threads—Class 3 fit

Save time and money by using standard UNBRAKO Button Head Socket Screws. Stocked in standard sizes—#8 through ⅝"—by your authorized UNBRAKO industrial distributor. Ask him for Bulletin 856. Or write STANDARD PRESSED STEEL Co., Jenkintown 2, Pa.

UNBRAKO SOCKET SCREW DIVISION **SPS** JENKINTOWN PENNSYLVANIA

NOW! Fast Fingertip Bleeding!

Patent Pending

New Greer-Lane Semi-Automatic Valve Ends Bleeding Problems Forever!

This new, revolutionary valve cuts hydraulic bleeding time to minutes, and saves costly hydraulic fluid. Effectively dumps air pressure of pneumatic systems too. A twist of your fingers . . . release . . . the job is done! It's fast, clean, safe and *self-cleaning*. No sediment can clog its tiny port openings or mar its operation. Precision-made to give years of dependable, trouble-free service. Easily installed. Each valve pays for itself quickly. Don't let poor bleeding methods bleed your pocketbook. Call or write Greer today.

GREER HYDRAULICS INC.
International Airport • Jamaica 30, N. Y.

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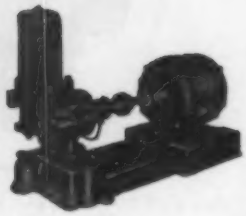
KRAISSL

• Since 1926 • in the application, design and manufacture—pumps, separators, hydraulic accessories.

EQUIPMENT FOR FLUID POWER TRANSMISSION



Rotary Air Pumps for vacuum bottling

Kraissl's patented, automatic, force-feed lubrication and flushing system makes these direct-drive, high-capacity pumps ideal for the special requirements of bottle-filling machinery.

Air-cooled design—or water-cooled models for heavier duty.

Class 21 roller-action pumps are recommended for handling corrosive gases and extraneous matter that might jam with closer clearances. The multi-blade design of the Class 25 pumps gives higher capacity efficiencies and is designed for applications requiring higher degree of vacuum.

Where water-cooling is desired for continuous service, the water-jacketed Class 25-WJ models are recommended.

Our exclusive Class 26 design air filter can be furnished as an integral part of each pump, up to 10 cfm—to produce oil-free discharge air and also conserve the lubricating oil.

Write today for Bulletin A-1289, for air-cooled pumps—and for A-1523 for the water-cooled models.

KRAISSL CO

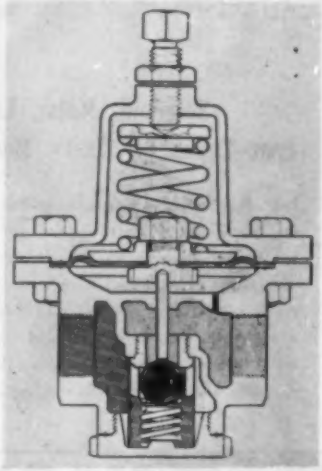
305 Williams Ave., Hackensack

New Products continued

PRESSURE REDUCING VALVE

. . . has very low pressure drop

Designation: Type 1260



Design: This self contained, single seat valve has a spherical, self cleaning inner valve. Free rotation of the ball allows different seating position at closure. Unit also has a large area built-in strainer.

Features: Low pressure drop is achieved through use of the venturi principle. Interior of the valve is readily accessible for easy servicing without removal from pipe line.

Specifications: Valve is available in aluminum, bronze, iron, steel and other specified materials. Operates within a range of 300 psi inlet pressure and 3 to 250 psi outlet pressure.

Applications: For use on a wide range of oil, air, water and non-corrosive fluid operations.

A. W. Cash Company
Decatur, Illinois

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RELIEF VALVE

. . . for pressures from 1 to 125 psi

Features: Sealing is provided by

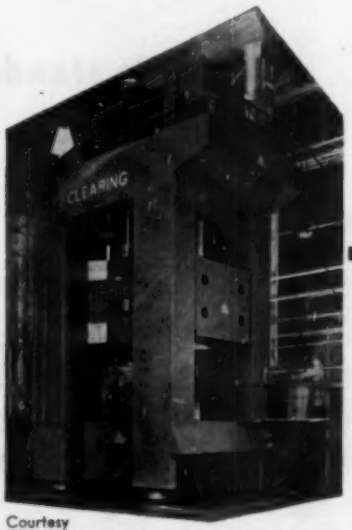
A Giant Clearing Press equipped with

Briggs
PIONEERS IN MODERN OIL FILTRATION

Hydraulic Filter

Big names—such as Clearing, Ingersoll, Askania and others specify Briggs.

No matter what the size of your machine may be there is a Briggs Hydraulic filter big enough or small enough to do a 100% job. Drop your problems in our lap—we'll be glad to put over a quarter of a century experience to work for you.



Courtesy Clearing Machine Corp.

HERE'S THE CLEARING PRESS AND HERE'S THE FILTER

Briggs can answer YOUR HYDRAULIC FILTER problem—large or small—filtration for oils or non-inflammable fluids.

WRITE FOR YOUR COPY OF BRIGGS HYDRAULIC BOOKLET

THE BRIGGS FILTRATION CO., DEPT. 51 RIVER ROAD, WASHINGTON 16, D. C.

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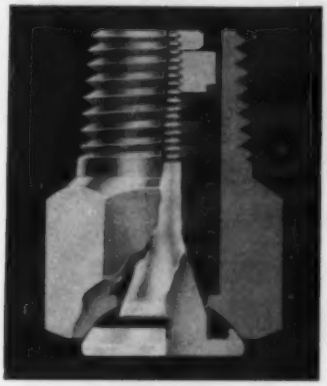
a resilient member fitted into poppet head which seats into a spherical section in the valve body. When in the closed position the metal-to-metal seating limits the compressive load on the resilient seal and con-



tains it to withstand the pressure load. Spherical valve seat eliminates need for close stem alignment and troublesome close sliding fits in the sealing area. Adjustment is internal.

James-Pond-Clark
Pasadena, California
Fill in No. 231 on Reader Service Card

AIR FILTER

. . . has cleanable elements

Features: Inlet air is channeled down a center tube to a curved baffle below the filter element where a centrifugal action removes dirt and water. A flat lower baffle pre-

vents accumulated water from being picked up by the air stream. Transparent plastic bowl helps remind to drain excess water.

Applications: For use on compressed air lines, air operated instruments and tools.

General Engineering Co.
Newark 3, New Jersey
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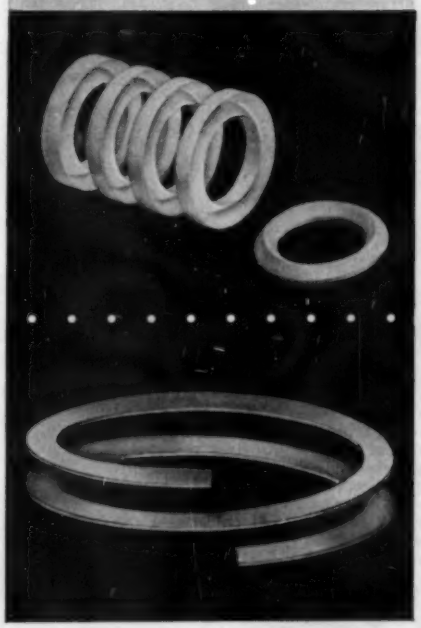
Continued on next page

finest hydraulic packing for plane or plant...

Chemiseal hydraulic packings ... made of chemically impervious duPont TEFLON—have zero swelling in all hydrocarbons, new synthetic hydraulic fluids and solvents. Require no chemical inspection. Unsurpassed anti-friction properties, are tough, resilient, non-flammable, long wearing. Wide service temperature range from minus 110°F to plus 500°F.



Chemiseal V-Type packings are ideal for either manual or automatically operated valves. Seal with low gland pressure and operating torque. Square end TEFLON adaptors are available if required. Catalog TP-1053.

Chemiseal Back-up rings prevent "O"-ring extrusion and greatly lengthen their life. Spiral, solid and split ring types are available in all commercial and AN sizes. Catalog OB-1152.

UNITED STATES GASKET COMPANY
CAMDEN 1, NEW JERSEY

USG

FABRICATORS OF FLUOROCARBONS & OTHER PLASTICS
Representatives in principal cities throughout the world

New Products continued

HYDRAULIC PRESSURE SWITCH

. . . with new strain relief mechanism

Designation: Class 9012 Type AWD

Design: New strain relief mechanism in the switch allows the range spring to absorb the impact of a violent pressure surge. Also a new feature is a Quad ring seal around the piston. It prevents oil leakage and eliminates necessity for an oil return line. Switch has snap action controls, one normally open and one normally closed.

Construction: Oiltight enclosure consists of a diecast case and gasketed cover. Cover is chained to case to prevent loss.

Applications: For use on hydraulic machine applications where surges of considerable magnitude are present.

Specifications: Available in a range of 135 to 1000 psi or 400 to 3000 psi.

Square D Company
Milwaukee, Wisconsin

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new! ADVANCED ENGINEERING FEATURES

new! EXTRA-HIGH FLOW RATES

new! QUICK OPENING LIDS

announcing

A COMPLETE NEW LINE OF HONAN-CRANE

OIL FILTERS

. . . the first in a series of important engineering developments by the NEW Corporation . . . HOUDAILLE-HERSHEY OF INDIANA, INC.

FULL FLOW—For in-line installation at high flow rates—25 to 800 GPM. Low pressure drop—only 4 PSI across unit at 170 SUS. Uses new "FLO-PAC" pleated paper cartridge permitting full flow of oil—removal of particles down to one micron.

MULTI-CARTRIDGE Eleven sizes to choose from with six different types of cartridge filter elements to give exact degree of filtration needed. New "FLO-PAC" and "KLEER-PAC" cartridges have large dirt holding capacities.

BULK REFILL—For absolutely clean oil—bulk Cranite filtering medium provides thorough depth type purification, removing all solids and products of oxidation in solution. Bulk or cartridge type cellulose refills available for fine filtering.

ALL MODELS HAVE QUICK-OPENING LIDS

Purifier lid is fastened with swing bolts which one man can loosen quickly. Lid swings back for easy access to refills.

Write for engineering bulletins and quotations on all three models.

HOUDAILLE-HERSHEY OF INDIANA, INC.
FILTRATION DIVISION

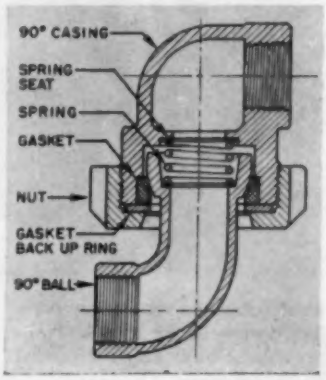
102 WABASH AVENUE, LEBANON, INDIANA

SWIVEL JOINTS

. . . for high pressure applications

Designation: Series 600 Type S

Features: The joint's self-aligning design simplifies and speeds up pipe fitting. It also automatically eliminates binding and guards against wear. These joints are produced in a complete range of sizes from ½ inch to 2 inches in four styles. All sizes have malleable iron casing and steel ball; sizes 1½ inches and 2 inches have steel nut and can also



be furnished in all steel construction.

Barco Manufacturing Co.
Barrington, Illinois

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PACKING DESIGN
. . . minimizes seal wear

Designation: Connealy Seal

Features: Seal fits into a standard groove having the recommended width to accommodate an O-ring and two back-up rings. Sealing is

effected by interference at low pressures and at high pressures a lip type of seal develops as a result of pressure distortion of the seal.

Applications: Recommended for difficult high pressure hydraulic and pneumatic operations.

Sili-Craft Rubber Corporation
Gardena, California

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Continued on next page

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Decco gives you a complete range of small, short-stroke, low-amperage, push or pull Industrial Type Solenoids manufactured with all the high quality of Decco Standard Size Solenoids. Built to J.I.C. specification, Decco Small Solenoids are shock-mounted to reduce self-destruction, have silicon steel laminations for efficiency, hardened beryllium-copper plunger guide, and heavy Formvar insulated magnet wire on high flow point molded nylon bobbins.

SPECIAL SOLENOID PROBLEMS ENGINEERED TO YOUR NEEDS

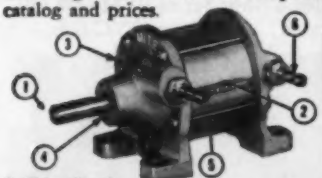
DETROIT COIL COMPANY

2435 HILTON ROAD • DETROIT 20, (FERNDALE) MICHIGAN

AIR-MITE AIR CYLINDERS

Low Cost . . . Compact . . . Powerful . . . Rugged

AIR-MITE Cylinders—made in single or double acting series—in 4 mounting types, are high quality cylinders at a low price. Simple, rugged design and compact construction give them long life, permit easy mounting on jigs, fixtures, tools, or machines. Used wherever power holding, pushing, pulling or lifting is required, AIR-MITE cylinders will meet your most exacting standards of dependability and long life. Write for complete catalog and prices.



1. Ground and polished steel rom
2. Brass, true-bore cylinders
3. High strength aluminum alloy cylinder heads
4. Bronze oilless rom bushing
5. Five steel tie rods
6. Brass hose stems

4 Mounting Types

AIR-MITE Devices, Inc.

4415 W. CARROLL AVENUE • CHICAGO 24, ILLINOIS

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WIGGINS INST-O-MATIC COUPLINGS

QUICK—DISCONNECT

use **WIGGINS COUPLINGS** for

OIL
AIR
WATER
L P GAS
HYDRAULIC OILS
PNEUMATIC
GASOLINE
REFRIGERATION
COOLANTS
HELIUM
NITROGEN
AMMONIA
KEROSENE
FUEL OIL
DIESEL OIL

Manual Quick Disconnect (Push-Pull Positive Action)

Automatic Quick Disconnect (Breaks Away at Pre-determined Weight Load)

SIZES: ¼" TO 2½

WRITE FOR FURTHER INFORMATION

Wiggins

E. B. WIGGINS OIL TOOL COMPANY, INC.

3424 East Olympic Boulevard, Los Angeles 23, California

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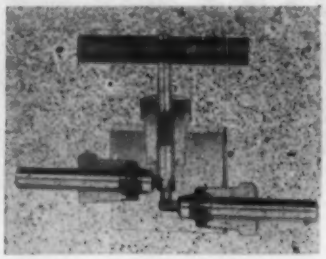
New Products / continued

NEW VALVE

. . . eliminates pipe-threading

Designation: TubeLine

Features: This new valve can be cut into lines faster and easier than conventional screw-end valves. Tubing is cut to desired length and burrs filed off. An adapter nut and sleeve are then slipped onto the tubing and connected to the valve.

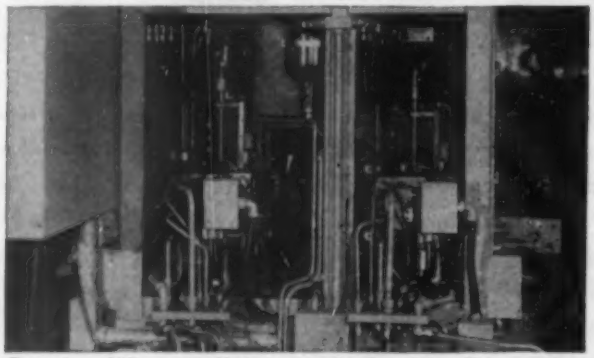


Construction: Valve body is made of type 304 stainless steel, valve stem of heat treated type 410 stainless steel with a rolled thread.

Specifications: Valves will hold pressures up to 4000 psi. They are available for four sizes of tubing, from 1/8 inch O.D. x 1/16 inch I.D. to ½ inch O.D. x ⅜ inch I.D.

Autoclave Engineers, Inc.
Erie, Pennsylvania

Fill in No. 236 on Reader Service Card



Rear view of Micromatic Hydrohoner, showing piping. This machine, a combination of two double-spindle honers, automatically finishes 500 automotive connecting rods an hour to a tolerance of a few tenths of a thousandth.

Easy-to-Form "SUPERIOR" Hydraulic Tubing Resists Vibration and Pressure Surges in Microhoning Production Equipment

Material used: SUPERIOR carbon steel hydraulic tubing, ½" OD x .049" wall and 5/16" OD x .035" wall.

Problem solved: The problem, the makers say, is threefold: ease of forming, ease of assembly, and ability to resist vibration and pressure surges of 100 to 500 psi without leakage. SUPERIOR tubing is the only tubing they have found that fills the bill. The non-aging hydraulic quality permitted the customer to keep an adequate supply on hand.

The process: Bores .006 in. to 40 ft. in length are regularly honed with Micromatic equipment. The Microhoning process is a method of automatically and rapidly removing stock from cylindrical surfaces. Microhoning produces geometrically straight and round holes, with uniform surface finish, and without generating localized heat.

Perhaps SUPERIOR can solve your problem, too. Use the coupon for free samples and literature. On the West Coast, write Pacific Tube Co., 5710 Smithway St., Los Angeles 22, Calif.

SUPERIOR TUBE COMPANY
2030 Germantown Ave.
Norristown, Pa.

☐ Send me a free copy of Bulletin 40—A Guide to the Selection and Application of Superior Tubing.

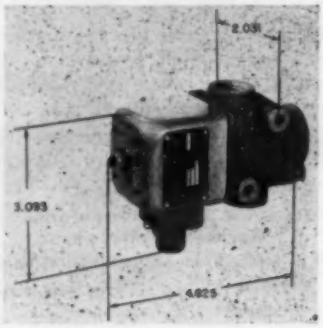
☐ Send me a free sample of ..... (name of alloy) tubing; ..... " OD; ..... " wall; to be used for .....

Name .....
Title .....
Company .....
Street .....
City ..... Zone ..... State .....

PNEUMATIC VALVE

. . . for industrial and aircraft applications

Features: Selection of solenoid operated shut-off and selector valves is offered. Pressure range is from 0 to



3000 psi., temperature range from minus 65 degrees F to plus 265 degrees F. Electrical current drawn is less than one amp at 24 volts D.C. continuous duty.

Mar Vista Engineering Co.
Los Angeles, Calif.

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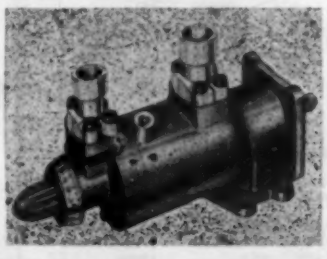
VARIABLE DELIVERY PUMPS

. . . feature new flow control design

Designation: Series PVM-600 (illustrated) and Series PVC-600



Design: Pumps are of the axial piston type, with nine equally spaced pistons in a fixed cylinder block. Series PVM-600 is equipped

Continued on page 136

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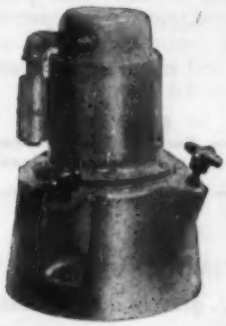
POWERMATIC

For: AIR HYDRAULIC PUMPS AND BOOSTERS

To: DEVELOP HYDRAULIC PRESSURES FROM 0 P. S. I. TO 18,800 P. S. I.



POWERMATIC PUMP

Small, Light Weight, Portable —Has Own Oil Reservoir, Pressure Control Valves And Air Motor — Maintains Even Constant Low Or High Pressures.

POWERMATIC BOOSTER

Small, Light Weight, Portable —Use With Any Oil Or Water Supply — Has Own Air Motor, Can Be Valved For Any Hydraulic Application.

POWERMATIC *Sales Company*

258 KENMORE BLVD. AKRON 9, OHIO

SEND your specifications for hydraulic cylinders to American, specialists in hollow boring and honing. We manufacture from tubing or forgings in carbon or alloy steels up to 15" I.D. Over 40 years experience backed by precision machines and skilled craftsmen will save you time and money. Send your blueprints.

Telephone ERIE 2-3664

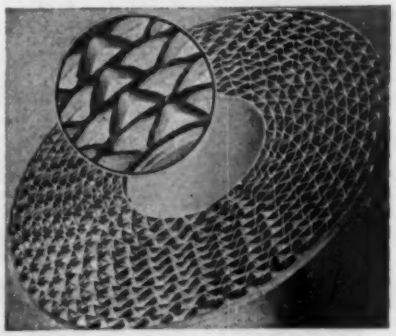
AMERICAN HOLLOW BORING COMPANY

1954 RASPBERRY STREET • ERIE, PA.

thinking of **PM*?**

Don't overlook the FRANTZ

Magnetic Separator



* PREVENTIVE MAINTENANCE

Here's one of a stack of strongly magnetized grids, the hard-working heart of a FRANTZ FERROFILTER. These grids comb and recomb ferrous particles rust and scale out of hydraulic oils. This keeps high pressure pumps and valves free to operate at highest efficiency; protects all surfaces subject to wear, reducing costly shutdowns and repairs of hydraulic equipment.

Send for BULLETIN PM-65

with complete information on how they are made to operate . . . on applications and available sizes.

If you're "from Missouri" try one on our Rental Plan.

S. G. FRANTZ CO., Inc.

P. O. Box 1138 Trenton 6, N. J.

New Products continued

with a handwheel control for manual output adjustment; Series PVC-600 incorporates a pressure compensated control for automatic pressure and flow regulation.

Features: Change in flow rate is accomplished by a design originally developed for high speed-high pressure aircraft pumps and here used for the first time in industrial pumps. Piston travel remains constant, but the effective pumping stroke is determined by the position of axially movable piston sleeves.

Applications: PVM-600 models are recommended for use on high-low pressure systems for hydraulic presses, closing and holding devices and machine tools. PV-600 pumps will handle a wide range of hydraulic fluids, including synthetics and fire-resistants.

Specifications: Generating continuous duty pressure up to 5000 psi, the PV-600 series pumps deliver 3.0 gpm at 1200 rpm; at maximum continuous speed of 2000 rpm, and at full rated pressure they deliver 4.0 gpm.

Dudco Division
New York Air Brake Company
Hazel Park, Michigan

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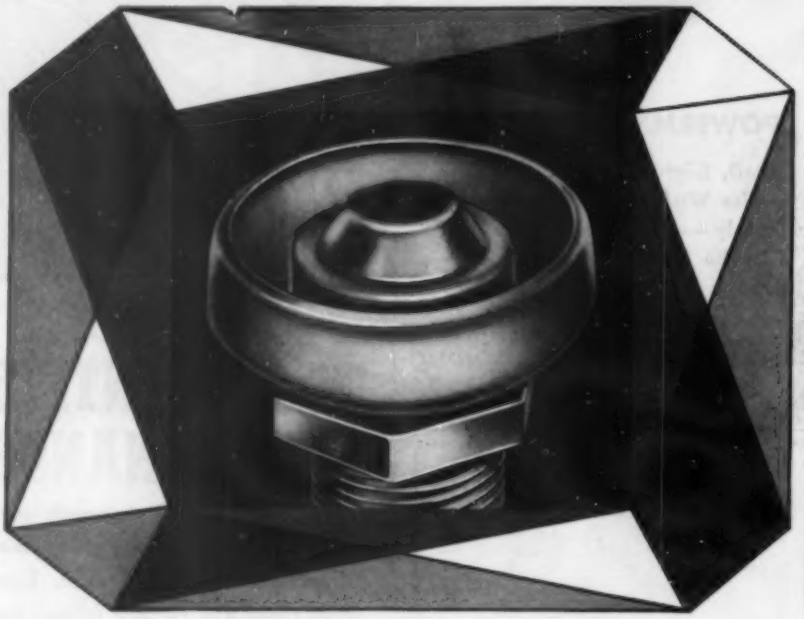

AN Type Seal Cap: for protection in handling, shipping and storage of aircraft hydraulic lines and components.

Perfection.....

EXTRA QUALITY • EXTRA STRENGTH • EXTRA FLANGE PROTECTION • CADMIUM PLATED STEEL • RE-USABLE • CONFORMS TO ALL APPLICABLE SPECIFICATIONS

TUBING SEAL CAP, INC.

808 WEST SANTA ANITA
SAN GABRIEL, CALIFORNIA

EASTERN OFFICE
428 NEW CENTER BLDG.
DETROIT 2, MICHIGAN

FITTING AND CHECK VALVE

. . . give low flow resistance

Features: Assembly consists of a Hoke ball type check valve and Swagelok ends. Synthetic rubber forms seat material, the spring is

stainless steel and gasket is made of fibre. The fittings will withstand vibration because the tubing is perfectly supported.

Specifications: Maximum operating temperature is 150 degrees F.

Crawford Fitting Company
Cleveland, Ohio

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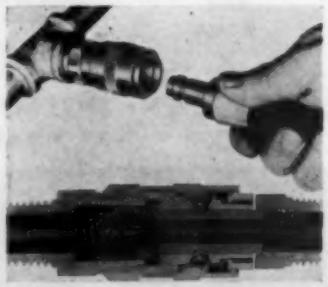
QUICK COUPLINGS

. . . for air and hydraulic hose

Designation: Pushomatic

Features: Couplings feature one-hand operation without turning or



twisting to lock. Automatically locks, making high pressure leak-proof connection. Integral check valve shuts off line or hose pressure when disconnected, preventing danger of backlash or whipping.

Specifications: Available in a

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READER SERVICE CARD

New IDEAS • FACTS • CATALOGS
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PERMIT No. 8066
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1	18	35	52	69	86	103	120	137	154	171	188	205	222	239	256	273	290	307	324
2	19	36	53	70	87	104	121	138	155	172	189	206	223	240	257	274	291	308	325
3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292	309	326
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293	310	327
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294	311	328
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295	312	329
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296	313	330
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297	314	331
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298	315	332
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299	316	333
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300	317	334
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301	318	335
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302	319	336
14	31	48	65	82	99	116	133	150	167	184	201	218	235	252	269	286	303	320	337
15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304	321	338
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305	322	339
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340

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3	20	37	54	71	88	105	122	139	156	173	190	207	224	241	258	275	292	309	326
4	21	38	55	72	89	106	123	140	157	174	191	208	225	242	259	276	293	310	327
5	22	39	56	73	90	107	124	141	158	175	192	209	226	243	260	277	294	311	328
6	23	40	57	74	91	108	125	142	159	176	193	210	227	244	261	278	295	312	329
7	24	41	58	75	92	109	126	143	160	177	194	211	228	245	262	279	296	313	330
8	25	42	59	76	93	110	127	144	161	178	195	212	229	246	263	280	297	314	331
9	26	43	60	77	94	111	128	145	162	179	196	213	230	247	264	281	298	315	332
10	27	44	61	78	95	112	129	146	163	180	197	214	231	248	265	282	299	316	333
11	28	45	62	79	96	113	130	147	164	181	198	215	232	249	266	283	300	317	334
12	29	46	63	80	97	114	131	148	165	182	199	216	233	250	267	284	301	318	335
13	30	47	64	81	98	115	132	149	166	183	200	217	234	251	268	285	302	319	336
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15	32	49	66	83	100	117	134	151	168	185	202	219	236	253	270	287	304	321	338
16	33	50	67	84	101	118	135	152	169	186	203	220	237	254	271	288	305	322	339
17	34	51	68	85	102	119	136	153	170	187	204	221	238	255	272	289	306	323	340

variety of styles and types in sizes ⅛ inch to ¾ inch. Application up to 10,000 psi.

Breco Division
Perfecting Service Company
Charlotte, North Carolina
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PORTABLE TOOL KIT

. . . for on-the-spot hose assembly

Features: Equipment was specifically developed for high temperature corrosion-resistant hose used in the jet aircraft field. Consists of a crimping unit, hydraulic pump, and

various accessories. Complete outfit fits into two carrying cases, which can be handled and operated by one man. A complete hose assembly of required length can be tailored right on the job in as little as three minutes.

Resistoflex Corporation
Belleville, New Jersey
Fill in No. 241 on Reader Service Card

ROTARY JOINT

. . . permits 360 deg. rotation

Features: Rotary feature consists of hardened ball races and steel balls with an O-ring seal. Simplified con-

struction and complete 360 degrees rotation allows unrestricted flow and low torque at high pressures.

Specifications: Maximum operating pressure 3000 psi. Joint is available with any type of thread connection and materials for various applications.

Columbia Industries
Bay Village, Ohio
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Continued on next page

Selecting the right hydraulic component for each requirement takes years of experience — years of hydraulic system design and application. Picking the right supplier for all your needs is another problem sometimes solved by using more than one source. The common denominator for all your hydraulic problems can be the product line and experience background of H-P-M. A complete line of pumps, power units, valves, cylinders and accessories plus 77 years of hydraulic experience is the answer in most cases. When you're planning hydraulically, call on H-P-M. Write today for Bulletin 1101 — the handy condensed catalog of the complete H-P-M line.

HYDRAULIC PRESS
MFG. COMPANY
1084 MARION ROAD
MOUNT GILEAD, OHIO, U. S. A.

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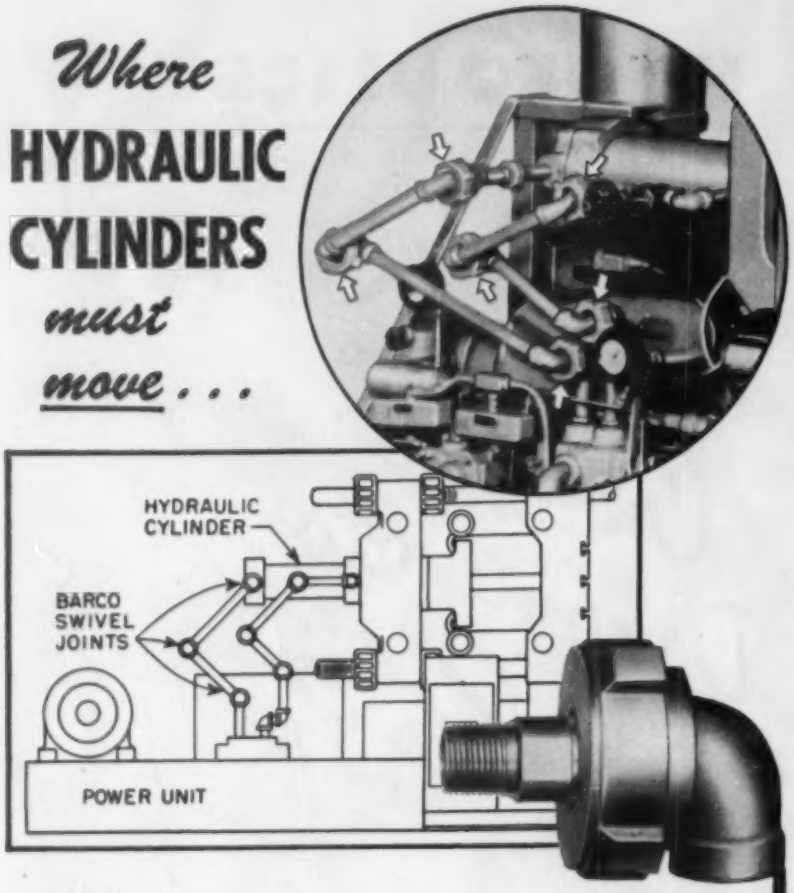
Where
HYDRAULIC CYLINDERS
must move . . .



Use
BARCO
Self-Aligning
SWIVEL JOINTS

THE Barco "Self-Aligning" Swivel Joint is one of the most useful, most versatile fittings ever developed for making flexible piping connections to moving or movable parts on injection molding presses, die casting machines, and other hydraulically operated equipment.

ENGINEERED INSTALLATIONS—Easy to position piping accurately. Put flexibility where you want it—without the nuisance of sagging, flopping, non-rigid lines. No restricted internal diameters.

BETTER CONTROL—No swelling or expansion in lines under pressure. Positive control action—no "mushiness."

PRESSURE SAFE—Barco Joints will not break or blow out suddenly. High temperature and fire resistance. Installations stay leakproof. No lubrication required.

EASY TO INSTALL—Barco's *self-aligning* feature simplifies and speeds up installation, saves time in pipe fitting, prevents binding, and minimizes wear.

Barco builds a complete line of swivel joints for every purpose. Ratings as high as 600°F., 3,000 psi (hydraulic). Sizes ⅛" to 2"; angle or straight. For complete information and recommendations, see our nearest representative or write BARCO MANUFACTURING CO., 532D Hough St., Barrington, Illinois.

ASK FOR BULLETIN 265A

BARCO

THE ONLY TRULY COMPLETE LINE OF FLEXIBLE BALL, SWIVEL, SWING, AND REVOLVING JOINTS

New Products / continued

AIR VALVE

. . . for high speed operations

Designation: BVP1 and BVP2 (illustrated)

Features: This valve is solenoid valve-piloted by full line pressure, has higher actuation rates, operates

on shorter electrical signal and with shorter reaction time.

Specifications: Available in two models, BVP1, single solenoid, spring return, and BVP2, double solenoid. Both models are available in ⅛, ¼, ⅜ and ½ inch (modified) NPT sizes, 3 or 4 way; they are equipped with a ½ inch NPT electrical conduit outlet.

The Beckett-Harcum Company, Inc.
Wilmington, Ohio

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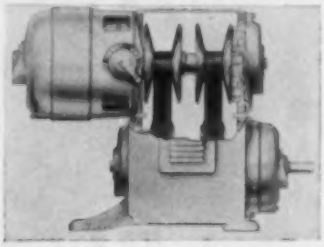
VARIABLE SPEED MOTOR

. . . has increased horsepower

Features: To provide for extra heavy-duty this increase in power of the U.S. Varidrive motor, broadens the application of variable



speed. These larger capacity motors are equipped with dual varibelts of double-ribbed design which divide transmission load so that excessive strains are avoided. They may also be equipped with remote controls, either mechanical or electrical.

U.S. Electrical Motors Inc.
Los Angeles, California

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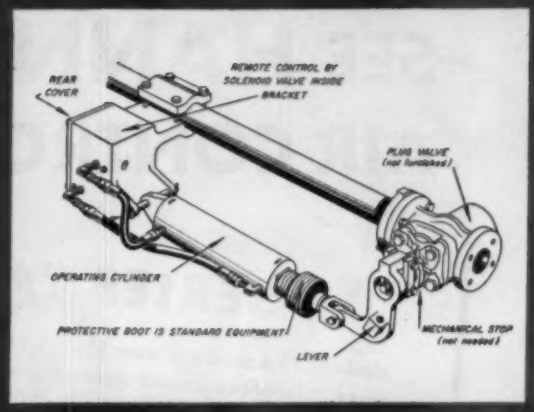
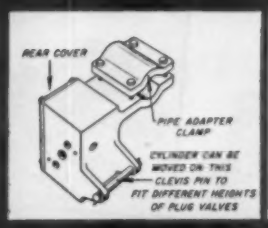
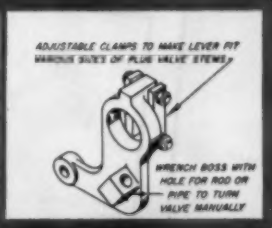
Pantex

PLUG VALVE ACTUATORS

the most modern and widely accepted, packaged actuator for wrench-operated plug valves...





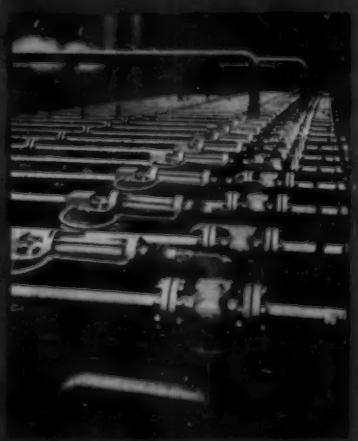

ADJUSTABLE CLAMPS TO MAKE LEVER FIT VARIOUS SIZES OF PLUG VALVE STEMS
WRENCH BOSS WITH HOLE FOR ROD OR PIPE TO TURN VALVE MANUALLY

The result of several years of research engineering, the Pantex Plug Valve Actuator is used in power plants, oil pipe lines, water pipe lines of municipal waterworks, industrial boilers, chemical plants, in fact — wherever remote or automatic control of a plug valve is desirable. Pneumatically powered, the Pantex Plug Valve Actuator will operate in any position and on all sizes of wrench-operated plug valves.

Designed and shipped as a complete *packaged* unit, including hoses and with the solenoid valve incorporated as an integral part of the actuator. Can also be supplied for hand valve operation. This makes the unit extremely easy to install without designing and fabricating special mounting brackets.

For complete details, see your nearest distributor or write direct to Pantex Manufacturing Corporation for Bulletin.

Typical Pantex Plug Valve Actuator installation as installed in plant of Consolidated Chemical Industries in Baytown, Texas.



30 unit test bank at the E. K. Co. in Ventura, California

Pantex

MANUFACTURING CORPORATION
PAWTUCKET, RHODE ISLAND

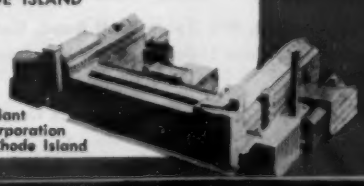


Photo of the 250,000 sq. ft. plant of Pantex Manufacturing Corporation at Pawtucket, Rhode Island

SEE HANNIFIN FOR ALL YOUR AIR CONTROL EQUIPMENT NEEDS

SERIES "A" AIR CYLINDERS

Made in 11 bore sizes from 1½" to 14"... 13 standard mountings... many combinations. Extremely close tolerances insure accurate, easy mounting. Steel heads. Cylinders of hard-drawn, high strength brass honed to a satin finish. Piston rods ground and polished then hard chrome plated for extreme smoothness as well as corrosion resistance.

TYPICAL MOUNTING STYLES

Centerline Lugs | Clevis Mounted | Rod End Flange | Blind End Flange

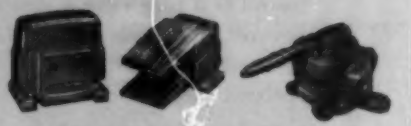
Double Rod End | Side Lugs | Holes in Rod Head | Angle Mounted

WRITE FOR BULLETIN 213

Just off the press. The easiest catalog to use in the cylinder business. Write today.

HANNIFIN AIR CONTROLS

Hannifin has the most complete line of air control valves. Exclusive designs, many types, for hand, foot, cam or solenoid control of air cylinders, presses, and other air-operated equipment. Ask for recommendations.



DISC-TYPE VALVES

Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation.

P-M PILOT-MASTER VALVES

The P-M line provides faster, easier operation for the simplest to the most complicated air-operated circuit. 2-Way, 3-Way and 4-Way Master Valves and Solenoid Pilot-Master Valves... also direct operated 3-Way and 4-Way valves with a wide choice of operating heads.

WRITE FOR CONTROL VALVES CATALOG

The complete air controls catalog! Write for your copy today.

HANNIFIN

Hannifin Corporation, 545 South Wolf Road, Des Plaines, Illinois

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

Useful Literature

continued

HYDRAULIC AND PNEUMATIC COMPONENTS . . . such as valves, cylinders, test equipment and fittings for aircraft applications, are featured in a comprehensive Bulletin 155, issued by Aircraft Products Co. The bulletin also outlines the company's engineering organization which is geared to design, develop and manufacture components to meet specific requirements. Complete specifications, operation and design features of the components are shown.

Fill in No. 172 on Reader Service Card

CENTRIFUGAL PUMP . . . of the new BDM Type, which is equipped with mechanical shaft seals, is featured in Bulletin No. 243 available from Pennsylvania Pump and Compressor Company. Pump is available in three, four, five and six inch sizes for maximum working pressure with cold water of 150 psig. Line drawing and dimensions of unit are given.

Fill in No. 173 on Reader Service Card

HYDRAULIC PACKING . . . of a split "V" ring design has been developed by Linear Incorporated. A Data Sheet, 2811-1A, describes the Vee-Dam ring, designed for leakproof operation. This new design places sturdy moulded rubber dams in the grooved hinge area of the ring. Instructions for installation of the packing are presented.

Fill in No. 174 on Reader Service Card

STEEL TUBING . . . produced by a high cycle, electric resistance welding method known as Fusion-weld, is the subject of a new 8 page brochure prepared by Avon Tube Division, Higbie Mfg. Company. This tubing, available in sizes from ⅛ inch O.D. to ¾ inch O.D. with wall thicknesses from .017 to .049 inch is made from high quality steel. Literature discusses its construction, characteristics and applications, also includes illustrations.

Fill in No. 175 on Reader Service Card

AIR TRAPS . . . for automatic drainage of water from compressed air inter-coolers, after-coolers, receivers, separators and drip points are featured in a 4 page bulletin. It describes the methods of selecting and installing these units, shows detailed drawings, physical data and list prices. Literature is available from Armstrong Machine Works.

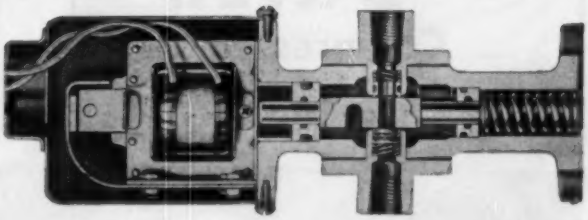
Fill in No. 176 on Reader Service Card

BASIC SWITCHES . . . manufactured by Micro Switch, a Division of Minneapolis-Honeywell Regulator Company, are described in new literature. This 28 page catalog, No. 62, lists over 400 basic switches, auxiliary actuators and terminal enclosures. Ten classifications of the standard line and precision snap action basic switches, including those with high electrical capacity, high sensitivity, single-pole, double-pole and

Continued on next page

COMPARE 20 OZ. PER MINUTE INTERNAL LEAKAGE IN THE MOST WIDELY USED TYPE OF VALVE
AGAINST 10 DROPS IN A BARKSDALE SHEAR-SEAL VALVE — SAME SIZE AND CONDITIONS — AND ZERO EXTERNAL LEAKAGE

INTERNAL VALVE LEAKAGE COSTS MONEY



Shear-Seal Solenoid Valves to 3000 P.S.I. — Shut-off, 3-way and 4-way.

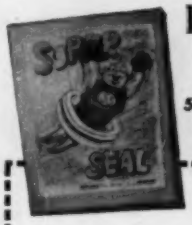
There is a direct ratio between the amount of leakage in a valve and the expense from it.

Both, the leakage and the expense, are insidiously hidden. But, let's bring them out in the open (see the two measures above). Primary damage through leakage shows up as erosion, wear and high maintenance cost of the valve itself. In contrast, Shear-Seal valves actually improve their sealing qualities with each operation. (Write for "Super Seal explains the Shear-Seal Principle.")

Higher, yet hidden damage results when leaky valves constantly exhaust accumulators, overwork pumps and compressors, or increase the scrap rate through loss of working pressure.

Furthermore, leakage creates heat in your hydraulic system accelerating wear and deterioration in costly machinery and components. Ironically, the valves are often overlooked as the real culprit in such failures.

For greater operating economy and lower overall maintenance install leakproof Shear-Seal valves.



BARKSDALE VALVES

5125 ALCOA AVE., LOS ANGELES 58, CALIF.

Send FREE bulletin "Super Seal Explains the 'Shear-Seal' Principle."

NAME _____ TITLE _____

COMPANY _____

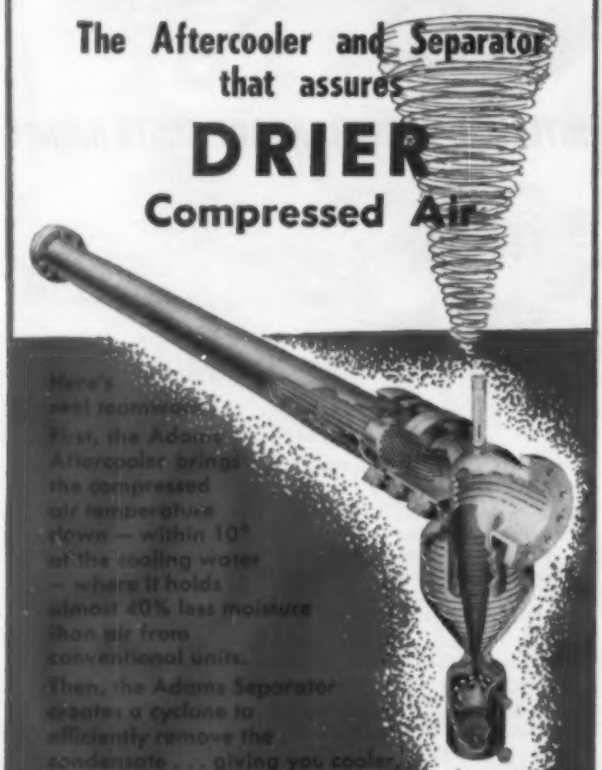
ADDRESS _____

CITY _____ ZONE _____ STATE _____

This Adams CYCLONE Saves You MONEY!

The Aftercooler and Separator that assures

DRIER Compressed Air



Here's real teamwork. First, the Adams Aftercooler brings the compressed air temperature down — within 10° of the cooling water — where it holds almost 40% less moisture than air from conventional units. Then, the Adams Separator creates a cyclone to efficiently remove the condensate . . . giving you cooler, drier air for your system. Thousands in use throughout industry. It will pay you to find out all the details. Mail the coupon below today.

R. P. ADAMS CO., Inc.

Buffalo 17, New York

R. P. ADAMS CO., INC. M-55

249 East Park Drive
Buffalo 17, N. Y.

Please send my FREE copy of Bulletin #177 on Adams Cyclone Separators and Aftercoolers.

Name..... Firm.....

Street..... City..... State .....

Useful Literature / continued

many others suitable for use in either alternating or direct current applications are covered. Dimensional drawings, terminal variations, electrical ratings and complete technical information are given.

Fill in No. 177 on Reader Service Card

VALVE COMBINATION UNIT . . . consisting of solenoid valve, flow rate control and inlet strainer is described in an 8 page folder published by Hays Manufacturing Co. The unit, designated Electro-Mite, is designed for applications that require a small flow rate of not less than 2/10 gpm or more than 6/10 gpm of water. It can also be used on air. Solenoid valve is direct operated, normally closed; unit can be installed in any position. The catalog contains flow rate charts and standardized specifications.

Fill in No. 178 on Reader Service Card

AIR AND HYDRAULIC COMPONENTS . . . of the complete line manufactured by Modernair Corp. is given in a new 14-section loose-leaf catalog and data book. This manual, presently totalling 120 pages is designed for easy inclusion of new products and modifications. Complete operating data, dimensions, mountings and general information usually required by users of fluid power devices are presented.

Fill in No. 179 on Reader Service Card

¾ HP VARIABLE SPEED HYDRAULIC TRANSMISSION . . . for industrial applications is described in a 2 page bulletin available from Vickers Incorporated. The bulletin, No. 47-40B details operational advantages and design features of the unit. A chart of output speed ranges for various recommended input speeds is presented, and installation drawings for both handwheel controlled and servo controlled models of the ¾ hp hydraulic unit are also included.

Fill in No. 180 on Reader Service Card

AIR COMPRESSORS . . . The complete line of water cooled air compressors manufactured by Quincy Compressor Co., is described in a new 8 page brochure. Standard features found on the units are illustrated in a cut-away photograph and detailed. They include non-breakable valves, semi-steel pistons, totally enclosed crankcase, Lynite connecting rods and others. Dimensions, specifications and typical applications are also shown.

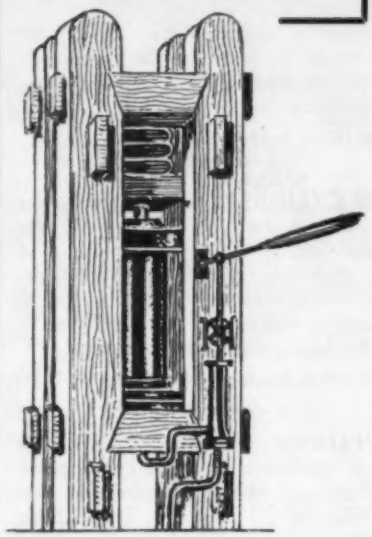
Fill in No. 181 on Reader Service Card

HYDRAULIC MULTIPRESS . . . is the subject of an attractive 24 page catalog 120-C prepared by The Denison Engineering Company. It shows how many manufacturing problems can be solved through use of this press. Actual photographs of the machine in action with detailed descriptions of the various opera-

Continued on page 144

Fill in No. 72 on Reader Service Card

THE FIRST HYDRAULIC PRESS WAS A BRITISH INVENTION BY JOSEPH BRAMAH, AND THE FORERUNNER OF ALL HYDRAULIC PRESSURE MACHINES



BRAMAH PRESS 1795

The HYDRAULIC ASSOCIATION of Great Britain

94/98 Petty France, London, S.W. 1
England

Fill in No. 150 on Reader Service Card

EXTREME CONDITIONS OF TEMPERATURE - PRESSURE-CORROSION MET WITH UNITED

metallic O-rings

Self-Energizing and Standard

16 page book of basic information regarding the application of metallic O-rings. *When to use* Self-Energized metallic O-rings. *Pressure and temperature ranges. Groove sizes. Degree of micro finish. Metals and plating surface.*

6 loose leaf pages of engineering data covering metallic O-ring and groove dimensions for nominal tube sizes of 1/16, 3/32 and 1/8 inch cross sections.

The most authoritative book ever issued on the application of metallic O-rings to industrial and aircraft static seal requirements.

Write for your copy today
(on your company letterhead please) to Department E2

UNITED AIRCRAFT PRODUCTS, INC.
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SAVE UP TO 85% ON GOVERNMENT SURPLUS

MAGNI-FOCUSER

Has fine ground lenses of optical glass. Neutralizes eye strain from close work. Binocular design gives third dimensional vision. Allows freedom of both hands. Wear over glasses. Plastic frame with adjustable headband.

SIZES: 20" focal lgth. 1¾ power — 14" focal lgth., 1¾ power, 10" focal lgth., 2½ power; 8" focal lgth., 2¾ power ..... price each ONLY **10.50**

OTC TOOLS

See our complete line. Pullers for Gears, Bearings, Wheels, Pulleys, Bushings, Shafts, etc.

NEW 10 TON HYDRAULIC PRESS

SIZE: 65" high, 27" wide, 29" base

Use this Press in the Shop or take it with you on the job. Frame is 4" welded channel iron. Has 46" stroke, 25" dim. ram. Valve operates piston in both directions. Adjustable platform. Positive power Hand Pump with handle. 2000 PSI pressure gauge. **129.00**

HYDRAULIC EQUIPMENT

We stock over 100,000 Hydraulic Cylinders in 106 different types and sizes. These can be adapted wherever tremendous power is needed to push, pull, hoist, mould or drive, etc.

SPECIAL

Gives 28,006 lb. thrust using 1500 PSI line pressure as obtained from our hydraulic pumps. Will produce up to 40,000 lb. thrust with 3000 PSI. Can also be used on a low pressure air system. Has 4" bore; 18" stroke; 30½" long. Ideal for shop.

Part No. 29 NEW **43.95**

HYDRAULIC HAND PUMP

Operating pressure 1500 PSI. Cap., 1.5 cu. in per complete cycle ... **12.75**

HYDRAULIC ACCUMULATORS

A-28 FLOATING PISTON TYPE — 4"x 18" Built to stand 2,000 PSI **12.75**

A-5 VICKERS — 10" dia. Ball type. Built to stand 2000 P.S.I. **24.50**

NOTE: Stocks include bargains in Hydraulic Pumps — Valves — Motors — Boosters — as well as Oil, Water and Fuel Pumps, etc.

WORLD'S MOST AMAZING BARGAIN CATALOG

OVER 320 PAGES

Packed with SENSATIONAL VALUES in GOV'T SURPLUS — FACTORY CLOSE-OUTS — and GENERAL MERCHANDISE. Fully priced and illustrated. Thousands of items in Machine and Industrial Tools — Hydraulic Equipment such as Cylinders, Pumps, Valves, Motors, Fittings, etc. Bargains in Electric Motors, Generators, Blowers, Parts, etc. Also Hand and Power tools, Precision Instruments, Bearings, Hose Clamps, Winches, Foam Rubber, Microscopes, etc. ALL AT PALLEY BARGAIN PRICES — PRICED TO SELL!

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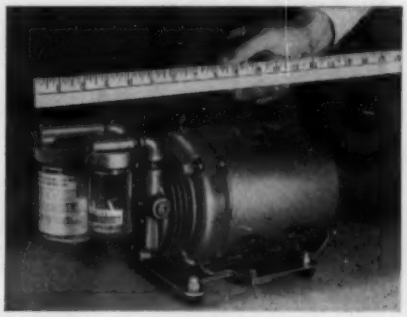
Pay by M.O. or check. P.O.'s accepted from D&B firms. To deposit with C.O.D.'s

Fill in No. 111 on Reader Service Card

I NEW GAST Model 0211 AIR PUMP weighs ⅓ less — is a truly COMPACT COMPONENT



This *new* Gast rotary-vane Air Pump offers many advantages, including: ⅓ less weight — (now 22 lbs.) — with more compact, streamlined design. Rotor mounted on new G. E. Form "G" motor shaft. Vanes give positive, pulseless air delivery. Rubber-cradled mounting dampens vibration, increases quiet.

Model 0211 produces up to 25 p.s.i. or 27" vac., or 1.3 c.f.m. running open. ⅛ h.p. motor uses only 3.8 amps. Ideal for automatic machines, industrial instruments and controls. Present uses: paper feeding in packaging, printing frames, or as portable laboratory air source.

Let *your* product benefit from this compact component — *write for Bulletin 1254 and "Application Ideas" Booklet!* **Gast Manufacturing Corp.,** P.O. Box 117-D, Benton Harbor, Michigan.

Original Equipment Manufacturers for Over 25 Years

GAST ROTARY
- AIR MOTORS TO 4 H.P.
- COMPRESSORS TO 30 P.S.I.
- VACUUM PUMPS TO 28 IN.

See Our Catalog in Sweet's Product Design File

Fill in No. 55 on Reader Service Card

Connect up with L and L

The Complete Line of Steel Fluid Power Couplings

JIC Flare Tube — Pipe Threaded
Flare Tube — Straight Thread "O" Ring
Flange Mounted — "O" Ring Seal

A—JIC Flare Tube Fittings
B—Manifold Fitting
C—Needle Valve
D—Pipe Nipple
E—Flange Manifold
F—Straight Thread, "O" Ring Seal Fitting
G—Ball Check Valve
H—Lateral Outlet Fitting
I—Universal Elbow
J—Dryseal Pipe Fitting
K—Hex Reducing Bushing
L—Swivel Elbow
M—Barbed Hose Stem

You can depend on L & L's quality, availability, and selection of steel couplings for piping all industrial hydraulic circuits.

L and L MANUFACTURING COMPANY

Distributors in principal cities
Write for catalog No. 53

Fill in No. 85 on Reader Service Card

Useful Literature / continued

tions show its versatility. An illustrated section describes the operation of the press and its accessories. The catalog also presents material on hydraulic pumps, controls, fluid motors and valves.

Fill in No. 182 on Reader Service Card

LOW PRESSURE CYLINDERS . . . are covered in the first section, catalog 101, of a series of new catalogs to be published by the Nopak Division of Galland-Henning Mfg. Co. Catalog 101, already issued is devoted to cylinders having 650 psi maximum pressure. Other catalogs will feature air and hydraulic valves, cylinders for high pressure applications.

Fill in No. 183 on Reader Service Card

FLEXIBLE COUPLINGS . . . of various shapes and designs which can be developed for oil and pneumatic lines are illustrated in a 4 page bulletin prepared by E. B. Wiggins Oil Tool Co. The bulletin shows two complex connecting problems which have been solved by the company.

Fill in No. 184 on Reader Service Card

HYDRAULIC COMPONENTS . . . for industrial applications are featured in a four page folder issued by Dowty Hydraulic Units Ltd. Shown are gear type pumps for working pressures up to 2000 psi with 1¼ to 50 gpm; control valves; jacks and self-sealing couplings.

Fill in No. 185 on Reader Service Card

SPLIT BALL BEARINGS . . . are shown in a new catalog, No. 54, giving information on various design features. Prepared by Split Ballbearing Corporation, the 24-page brochure shows single and double row ball bearing bushings in extra thin sections, fully split heavy duty pillow blocks, thin section instrument bearings in torque tube dimensions for precision applications. Dimensions, design data, load and speed ratings are also included.

Fill in No. 186 on Reader Service Card

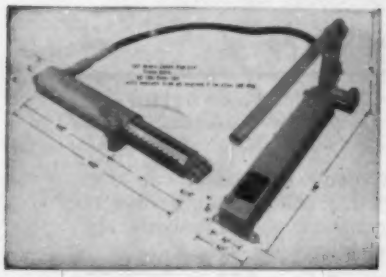
O-RINGS . . . made of synthetic rubber are featured in a 48 page O-ring handbook prepared by Plastic and Rubber Products Company. A table of suitability listing the various compounds from which O-rings are manufactured serves as a basis for selecting a compound most suited for a given application. The handbook contains a number of tables showing O-ring and groove dimensions. Anti-extrusion devices, static seals and rotary seals are also covered.

Fill in No. 187 on Reader Service Card

BREATHER FILTERS . . . designed for installation on hydraulic equipment, liquid storage tanks, compressors and other equipment are illustrated and described in a new catalog. Both oil-wetted and oil bath types are featured. The literature, available from Air-

Continued on page 146

Fill in No. 117 on Reader Service Card



HYDRAULIC SAFETY LATCH RAMS

(PATENTED)

"Hydro-Latch" Remote Control Hydraulic Rams of capacity or size to meet any requirements with built-in spring loaded safety latch, self-engaging as the ram travels out—either clevis or flange mounted. The rams will not rotate. Manually or mechanically operated. Standard size: 10 tons, 7 inches of travel. We solicit inquiries to fit your application.

WILLIAM S. PINE
1635 E. 22nd St., Los Angeles 11, Calif.

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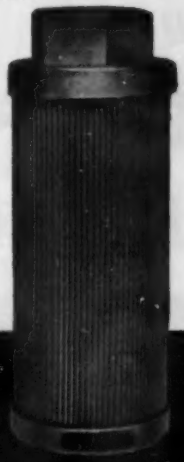
★ONLY THREE PARTS
★MEETS J.I.C. STANDARDS
★GREATER FILTERING AREA
★SPECIAL TRAP-WEAVE MESH



The New

CAPITAL HYDRAULIC OIL FILTER

WITH MONEL METAL INSERT

Reservoir Type for Hydraulic and Oil Re-Circulating Machinery

EASY TO INSTALL · EASY TO CLEAN · LONG LIFE · LOW COST

SIZES AND SCREENS TO FIT YOUR NEEDS

CAPITAL ENGINEERING & MFG. CORP.
5837 South Ashland Avenue Chicago 36, Illinois

"MONOBALL"

Self-Aligning Bearings

CHARACTERISTICS

	ANALYSIS	RECOMMENDED USE
1	Stainless Steel Ball and Race	For types operating under high temperature (800-1200 degrees F.).
2	Chrome Moly Steel Ball and Race	For types operating under high radial ultimate loads (3000-893,000 lbs.).
3	Bronze Race and Chrome Moly Steel Ball	For types operating under normal loads with minimum friction requirements.

Thousands in use. Backed by years of service life. Wide variety of Plain Types in bore sizes 3/16" to 6" Dia. Rod end types in similar size range with externally or internally threaded shanks. Our Engineers welcome an opportunity of studying individual requirements and prescribing a type or types which will serve under your demanding conditions. Southwest can design special types to fit individual specifications. As a result of thorough study of different operating conditions, various steel alloys have been used to meet specific needs. Write for revised Engineering Manual describing complete line. Address Dept. AH-55.

SOUTHWEST PRODUCTS CO.
1705 So. Mountain Ave. · Duarte, California
(LOS ANGELES COUNTY)

Low-cost ready-made hydraulic tanks

top-notch DESIGN
large top SURFACE
a complete LINE
all tanks IN STOCK
ALL WELDED construction
write today for CATALOG

Attention Dealers—write us for more information.

Rosaen Reservoirs do away with makeshift, unsightly home-made construction, give you instead a ready source for standardized, properly engineered reservoirs and all mounted accessories. Produced in volume, the price beats building or buying them to special order. All parts carried in stock.

The Rosaen Company will also assemble complete power units to order, and supply all hydraulic components if desired.

The ROSAEN COMPANY
24100 HARPER • ST. CLAIR SHORES, MICHIGAN

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Fill in No. 129 on Reader Service Card

You get AIRCRAFT QUALITY

To preserve their quality and shape, and permit easy installation, 50 Fluoroflex-T spiral rings come snugly seated on supporting mandrel, secured with rubber rings at each end, and in a "telescopic" container.

Millions in use verify high performance

Fluoroflex-T anti extrusion rings are produced from virgin Teflon® powder under a strict quality control and inspection system approved by the USAF under MIL-Q-5923. Millions of them are today contributing to more reliable functioning of "O" ring seals in both commercial and military aircraft hydraulic systems.

Fluoroflex-T is processed so as to relieve internal stress without creating porosity. This means maximum dimensional stability and tensile strength . . . which in turn assure optimum performance and service life.

With properties conforming to AMS-3651, Fluoroflex-T rings reduce friction, are entirely unaffected by any hydraulic fluid both physically and chemically, and withstand up to 500°F, depending upon operating pressures.

Complete range of sizes available for use with AN6227 and AN6230 series "O" rings. Send for data.

®Fluoroflex is a Resistoflex registered trade mark for products from fluorocarbon resins. Teflon is the DuPont registered trade mark for its tetrafluoroethylene resin.

RESISTOFLEX
CORPORATION
Belleville 9, N. J. • Western Division: Burbank, Calif.

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Useful Literature / continued

Maze Corporation contains more than two dozen engineering drawings and photographs, devotes one section to detailed specifications of all models, highlights design and operating advantages.

Fill in No. 188 on Reader Service Card

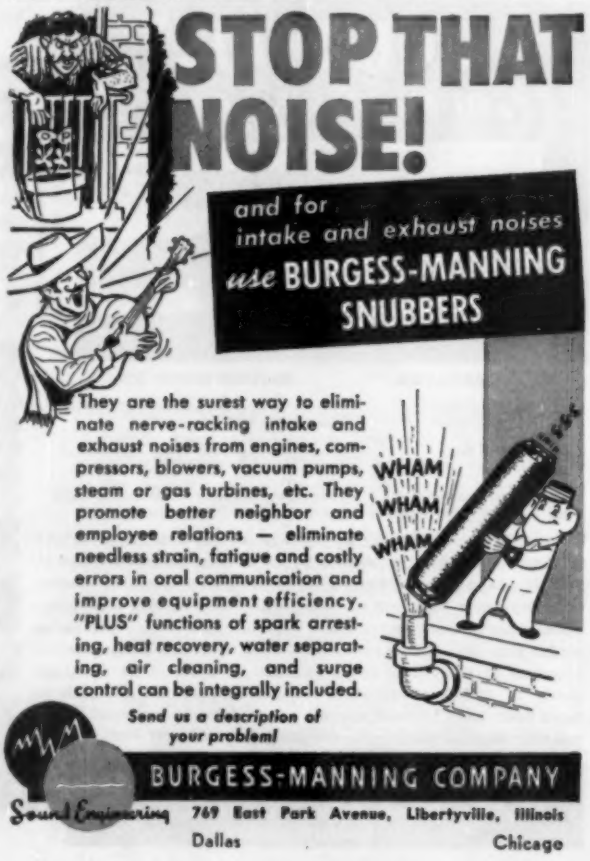
PERFORMANCE DATA . . . on porous Teflon filter media and complete filter units using this material are described and illustrated in a data bulletin T-115 offered by the Porous Plastic Filter Company. Information on the thermal and mechanical properties of this material is also presented.

Fill in No. 189 on Reader Service Card

AIR VALVE . . . known as the Comet is detailed in a new 4 page Bulletin 308. This solenoid operated, four-way valve, manufactured by Ross Operating Valve Company, has only one moving part—a balanced spool. Standard and optional features, recommended service, installation data and a parts list with an exploded drawing are shown.

Fill in No. 190 on Reader Service Card

FILTERS . . . with honeycomb filter tubes are shown in a new 4 page condensed catalog. Offered by Commercial Filters Corporation, the catalog features all


STOP THAT NOISE!
and for intake and exhaust noises
use BURGESS-MANNING SNUBBERS
They are the surest way to eliminate nerve-racking intake and exhaust noises from engines, compressors, blowers, vacuum pumps, steam or gas turbines, etc. They promote better neighbor and employee relations — eliminate needless strain, fatigue and costly errors in oral communication and improve equipment efficiency. "PLUS" functions of spark arresting, heat recovery, water separating, air cleaning, and surge control can be integrally included.
WHAM
WHAM
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Send us a description of your problem!
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Sound Engineering
BURGESS-MANNING COMPANY
769 East Park Avenue, Libertyville, Illinois
Dallas
Chicago

Fill in No. 22 on Reader Service Card

their filters available for general industrial use. It is boiled down giving only the engineering information essential for the engineer to select the type which would meet a particular problem. Completely detailed literature is available for each of the models listed.

Fill in No. 191 on Reader Service Card

AIR CYLINDER . . . with four different mounting types—foot, front flange, rear flange, and clevis—integrally incorporated into one unit without the use of bolts, screws, brackets and mounting plates is described in a four page brochure prepared by Pathon Manufacturing. Construction diagrams and bore dimensions are included.

Fill in No. 192 on Reader Service Card

HYDRAULIC RESERVOIRS . . . Complete hydraulic reservoirs including breather, filler, gaskets, oil return lines, drain cock, and oil level gages are illustrated in a catalogue of The Rosean Co. The catalogue includes installation drawings of several models of reservoirs with accessories. Also included is a price list for reservoirs and assembled power units.

Fill in No. 194 on Reader Service Card

HYDRAULIC CONTROL MANIFOLDS . . . to simplify machine design are presented in a 4-page brochure of the Almo Tool Co. Literature describes the operation and applications of hydraulic circuit control manifolds for hydraulically controlled machines. Also shown is the procedure for obtaining price and layout proposals on these manifolds.

Fill in No. 195 on Reader Service Card

SOLENOID-CONTROLLED, PILOT-OPERATED VALVE . . . A new ¾ inch, balanced piston sleeve type valve, manufactured by Racine Hydraulic Machinery, Inc. is described in their catalogue 54-B. The catalogue presents cutaway and cross-section drawings of this 4-way valve along with outstanding construction and operation features. Dimensions of the unit are included as well as a schematic diagram illustrating arrangement of throttling orifices which can be installed on the valve.

Fill in No. 196 on Reader Service Card

Keeping hydraulic and lubricating oils free from impurities can be a costly process — one demanding the frequent draining and refilling of entire oil systems. But with the GENERAL AF-500's positive absorption . . . moisture, dirt, rust, tars and lint are *safely trapped* in the finest wool felt, assuring trouble-free, uninterrupted operation of oil systems for as long as a year! Machine parts are protected from abrasive wear and maintenance costs are reduced on both new and old equipment.

No other Filter like it!

TWO-FOLD ELEMENT

The AF-500 actually works two ways — its ALL-WOOL felt element traps *moisture* and dirt particles as fine as *5 microns.*

CLEAN, SAFE LIQUIDS

Clean, completely dependable oils, paints, lacquers and other industrial liquids are assured at 15-20 gpm, depending on viscosity.

LONGER MACHINE LIFE

Both on new and old equipment, GENERALS protect vital machine parts from abrasive wear, greatly prolonging service life.

SIMPLE DISASSEMBLY

Cleanable wool felt cartridge can be quickly removed and washed in any suitable solvent without disturbing inlet or outlet lines. Merely unscrew center bolt, lift off cover and two washers, and remove felt cartridge intact.

WRITE **us — without obligation — about your industrial filtering problems.**

GENERAL FILTERS, INC.

43800 GRAND RIVER AVENUE, • NOVI, MICHIGAN
CANADIAN GENERAL FILTERS, LTD., 2679 DANFORTH AVENUE
TORONTO 13, ONTARIO

Fill in No. 56 on Reader Service Card

Post Scripts of Industry

News about people, manufacturers and sales organizations

John D. Wilson
Standard Pressed Steel Co.

Ralph W. Moss
Haskel Engineering and Supply Co.

George Corsi
National Motor Bearing Co., Inc.

John D. Wilson was promoted to manager of **Standard Pressed Steel Co.'s** Sel-Lok Spring Pin Division. Wilson, who went to work for SPS in 1951 as a machine operator, is now responsible for engineering, production scheduling and sales.

Ralph W. Moss was appointed sales manager of **Haskel Engineering and Supply Company.** In addition to his new duties, Moss will continue as vice-president and sales manager of Haskel Seals, Inc. **Haskel Seals, Inc.,** also announced that they have become exclusive California distributor for Molykote lubricants.

Kelburn Engineering Co. will be exclusive sales representatives for the **S-P Mfg. Corporation's** air and hydraulic cylinders in the Chicago territory. **Tool Equipment Co.** will continue as representatives for S-P power chucking equipment in the same area.

National Motor Bearing Co., Inc., established a new oil seal application engineering service in the Detroit area. To direct this new service the company created the new position of chief applications engineer and named **George Corsi** to the post. Corsi, with the company for 15 years, was previously chief process engineer for all NMB plants.

Lear, Inc., purchased the design and manufacturing rights to all the hydraulic and pneumatic servo systems and components of Auto-Control Laboratories.

Char-Lynn Company appointed its first distributor in California, **Power Transmission Company.** The company, located at San Jose, will cover the northern California territory.

Leach Relay Co., Division of Leach Corporation named the following representatives: **L. M. Beier Company,** Chicago, will cover Illinois, eastern Iowa, and eastern Wisconsin. **B. S. Woodman, Inc.,** Atlanta, will cover the states of North and South Carolina, Tennessee, Alabama, Georgia and Florida.

National Pneumatic Co., Inc. and its **Holtzer-Cabot Divisions,** appointed **Robert Broten** as field representative. He will be located at the New York branch office.

Chicago Belting Company announced the consolidation with its two subsidiaries, the Allis Rubber Corporation and Allis Seal Corporation. The new corporation is to be known as the **Chicago-Allis Mfg. Corp.**

Thomas Kramer has joined the sales staff of the Oil Hydraulics Division of **The Webster Electric Company.** He will function as factory sales representative in the eastern states.

Valvair Corporation and **Sinclair-Collins Valve Company** announced the opening of a new plant in Canton, Pa. The new plant operates under the manufacturing name of **Collins Valve, Inc.**

Raymond Shile was appointed manager of the new eastern sales office of **Palmer-Shile Company,** located at 550 Fifth Avenue, New York City.

A. Paul Vance has joined the functional fluids section in the sales department of **Monsanto Chemical Company's** Organic Chemicals Division.

The Ortman-Miller Machine Company has opened a new assembly plant in Hammond, Indiana. For closer co-ordination the new building also accommodates enlarged administrative offices.

Westinghouse Air Brake Company's Le Roi Division named **Paul I. Birchard** as vice president and general manager.

Ralph G. Holben was appointed vice president in charge of manufacturing of **Conoflow Corporation.** He will be responsible for the supervision of production, purchasing and maintenance of plant facilities.

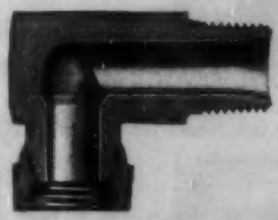
Lynn T. Miller was named to direct the new office and warehouse facilities in Portland, Oregon, by **The Rucker Co.** The new offices are located on 911 N.W. Hoyt St.

Andrew S. Kaminski, Jr., has become division manager of **Hamilton Rubber Mfg. Corp.'s** Chicago Branch.

Continued on next page

why GENERAL'S FUL-BORE does more!

CONTROLLED PRESSURE crimping process attaches FUL-BORE coupling *permanently* to single or double wire braid hose. This process assures longer life under extreme static and surge pressures.



GENERAL'S UNION ADAPTERS, 90° and 45°, reduce turbulence and pressure drop because of FUL-BORE and smooth *radius* instead of sharp angle at the intersecting bores.

Because high pressure hose assemblies by General are engineered to each specific application, the user gets resultant high performance and savings.

General's exclusive FUL-BORE feature means the bore diameter remains constant *throughout the entire hose and coupling assembly,* without flow restriction at any point.

The FUL-BORE feature makes more efficient use of standard sizes, and, in many cases, permits use of intermediate sizes not previously available.

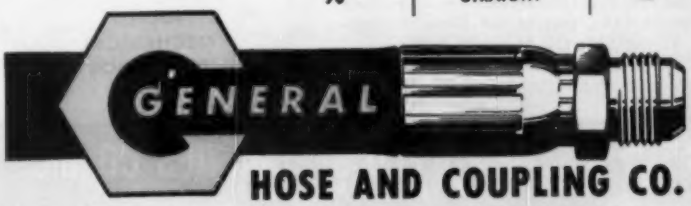
These intermediate hose assemblies are not only more economical, but can work under higher pressures. They have greater flexibility and longer life.

In all angle union adapters, exclusive design and manufacturing process provide a *smooth inside radius* – not a sharp angle at intersecting bores.

FUL-BORE permits increased fluid flow, cuts turbulence, reduces heat and pressure drop. This gets more pay-load work out of the equipment, plus longer service life.

Get the facts and you'll get General hose. Write us.

UNION ADAPTERS



GENERAL HOSE AND COUPLING CO.

409 BROAD AVENUE • PALISADES PARK, N. J.

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Post Scripts of Industry

continued

The appointment of **James J. Jenkins** as naval architect for **Greer Marine Corp.**, wholly owned subsidiary of Greer Hydraulics, Inc., was announced.

E. T. Parsons, after representing **The Garlock Packing Company** in the Philadelphia-Camden area for 23 years, has retired.

Durrie Sales Company, Chicago, was appointed **Hose Accessories Company's** representative for the Illinois, Indiana and Iowa territory.

A LITTLE "FULFLO" VALVE does a big job on THE WORLD'S LARGEST BAND SAW AND FILER

built by The DoAll Co., Des Plaines, Ill. for the Air Force's "Heavy Press Program"

Operated by remote control from a suspended platform, this huge machine cuts intricate die cavities in die blanks weighing up to ten tons. Intended for the world's largest extrusion press (14,000 tons), these dies will shape the largest and longest structural aluminum extrusions ever produced. Jaws for the world's largest extrusion stretch-conditioner (3,000,000) are also cut on this Band Saw.

• FULFLO VALVES

By-Pass, Oil-Relief, Piston Type Hydraulic for machine tool hydraulic mechanism, oil-burning equipment, rams, presses and Diesel engines.

STANDARD OR FLANGE TYPES for pressures from 0# to 500#

Write for personal copy.

FULFLO MECHANICAL DATA BOOK

FULFLO THE FULFLO SPECIALTIES CO. Inc.

PUMP AND VALVE MANUFACTURERS

BLANCHESTER, OHIO

Vickers Incorporated announced the following appointments and facilities: **Robert H. Mezger** will head the new district sales office opened in St. Louis, Missouri; **Arthur H. Van Wormer** to district sales manager in Cleveland, Ohio; a new branch office in the Dallas-Ft. Worth area for aircraft

Arthur H. Van Wormer
Vickers, Inc.

Robert H. Mezger
Vickers, Inc.

products. The new office will be located in Arlington Texas and **S. H. Murphy** was named application engineer; **Everett O. Clark** was appointed as the first director of the General Industrial Equipment Division of the Business and Defense Services Administration, U. S. Dept. of Commerce. Clark is on loan to BDSA from his Vickers position.

Ted R. Carrell was appointed by **The Parker Appliance Company** as O-ring sales engineer for the Pacific coast territory. He will headquarter at the Product Rubber Division, Los Angeles, and will work with Parker's distributors in California and Washington. Before

joining Parker he was lead engineer on hydraulic and fuel line connectors for E. B. Wiggins.

Consolidation of Gardner-Denver Company with Keller Tool Company has been announced. The latter becomes the **Keller Tool Division of Gardner-Denver Company** and continues operations under the former Keller management.

William G. Levans has joined **Goshen Rubber Co., Inc.,** in development and research. He was formerly associated with Parker Appliance Co.

The name of **Honan-Crane Corporation,** Lebanon, Indiana, has been changed to **Houdaille-Hershey of Indiana, Inc.** Honan-Crane was operated as a subsidiary of Houdaille-Hershey Corporation for the past ten years and is one of the pioneers in the oil and coolant filtration fields. The name

Continued on next page

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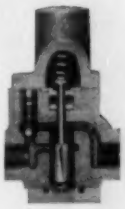
COMPACT DEPENDABLE EFFICIENT

Piston Style, Double Acting
BHEW Hydraulic Cylinder

OPTIONAL MOUNTINGS

It's easy and practical to use BHEW hydraulic cylinders in your applications. Accurately honed barrels, hard chrome-plated rods, small O. D. and any type mounting desired are BHEW cylinder features. All types and sizes available in standard and special O. E. M. designs. BHEW makes single and double acting, high and low pressure cylinders with cup-type, ring-type or O-ring construction. Send specifications of your requirements.

BHEW



Pressure Operated Hydraulic Flow Control Valves, for lift trucks, eliminate surge as load starts down. Load weight controls rate of descent, full speed raising and empty fork travel. Write for details.

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CLAMP YOUR WORK *HYDRAULICALLY!*

This folder shows how to SLASH ASSEMBLY TIMES

Simple • Inexpensive
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for
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WELDING • GLUEING
and every Clamping Problem

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HEAVY DUTY
PUSH TYPE
COUPLERS

The Tru-Flate Push Type "heavy duty" coupler, for air, oil and water circuits, employs the one hand connect and disconnect principle. Just insert the nipple without retracting sleeve—the valve is opened—your line is coupled — instantly. Available in two body sizes with pipe threads from ⅛" to ½". All working parts are case hardened steel.

No. 33 Coupler With No. 2C Nipple ¼ NPT Threads

LONGER WEAR—MORE AIR—LESS PRESSURE DROP—Than ever Before

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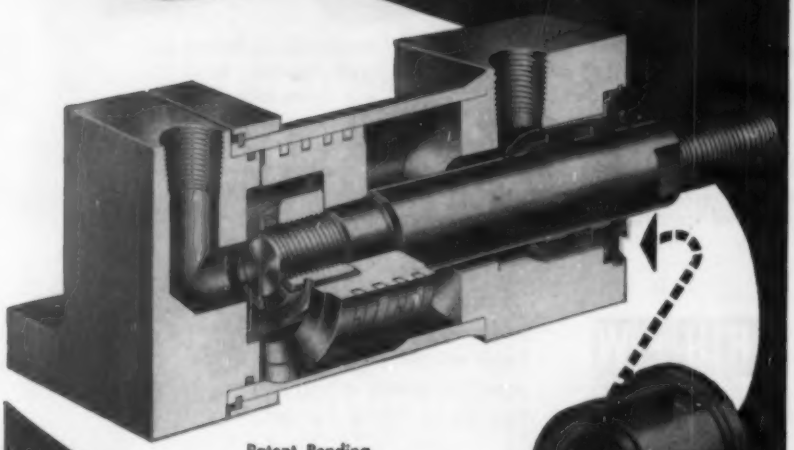
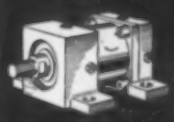
High Pressure HYDRAULIC CYLINDERS



Patent Pending

Cut downtime with "quick-change" rod packing cartridge

- 2,000 P.S.I.
- J. I. C. STANDARDS
- COMPACT DESIGN
- OPTIONAL ROD SIZES
- ALL-STEEL CONSTRUCTION
- 11 TYPES OF MOUNTINGS
- 11 BORE SIZES—1½" TO 8"
- UP-TO-DATE ENGINEERING



The S-P "quick-change" packing cartridge is easily removed for servicing seal or wiper. ***Cuts downtime . . . speeds production.*** S-P Hydraulic Cylinders have ***every*** modern design feature. Representatives in principal cities. Prompt deliveries. Send for Catalog 104. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916

AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

Post Scripts of Industry
continued

Honan-Crane will be retained to identify the company's oil filter equipment.

Graton & Knight Company named **James S. Hamer** sales representative for the territory covering west central Tennessee and Kentucky, northern Arkansas and Mississippi, and southern Indiana.

James S. Hamer
Graton & Knight Company

Robertshaw-Fulton Controls Company appointed **Levin P. Handy** as area field engineer of the Anaheim (Calif.) Division. He will headquarter in San Diego, covering this area.

The Hydraulic Press Manufacturing Company's Hydraulic Power Division appointed **Normar Engineering Company,** Chicago as representatives.

The Parker Appliance Company named **Keystone Pipe and Supply Co.,** Milwaukee, and **Metropolitan Supply Company,** Los Angeles, as distributors.

Standard Pressed Steel Co., promoted **Theodore H. Bourguignon** to the company's outside sales staff. With the company for 13 years, Bourguignon will headquarter in Indianapolis and cover southern Indiana, southwestern Ohio and all of Kentucky. **Donald C. Buecker,** who recently joined SPS was

assigned to the Minneapolis office covering all of Minnesota and western Wisconsin.

Webster Electric appointed **Haskel Engineering Supply Company,** Glendale, exclusive representative in the State of California, for their hydraulic pump line.

Paul E. Grube was appointed plant manager of **Columbia Steel & Shafting Co.** H. B. Reno, Jr. was named purchasing agent.

New York Air Brake Company appointed **Thomas W. Johnson** director of engineering. He will be in charge of engineering for the company's five divisions.

Thomas W. Johnson
New York Air Brake Co.

Lindberg Air and Hydraulic Division, Lindberg Engineering Company, appointed **C. J. Dudley** in Cleveland, and **D. C. Milner** in Akron as exclusive representatives.

Edward F. Swanezy, formerly sales representative for Chemical Div., Celanese Corporation of America in the New York metropolitan area, has become sales manager of the Chicago district. **M. Henry Jamison** has become sales manager of the newly established district sales office in St. Louis, Mo. **R. J. Werner,** formerly district sales manager in Chi-

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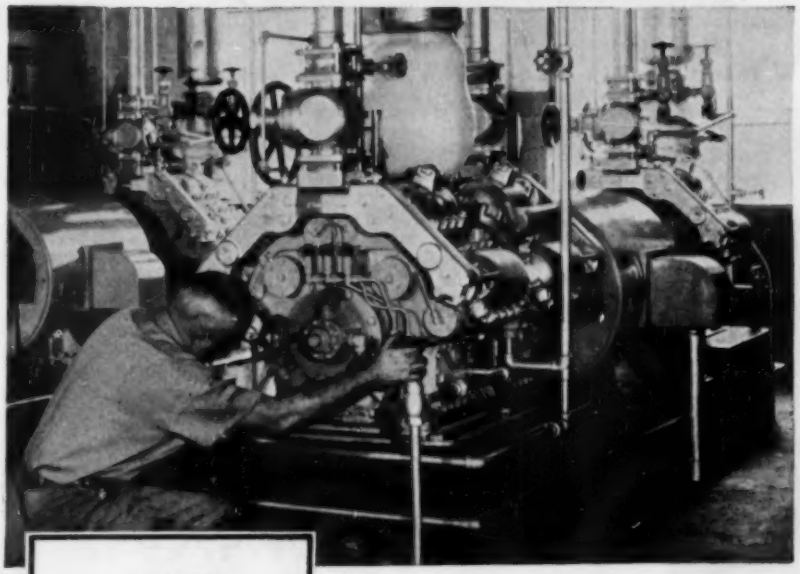
HOW TO PICK THE PUMP TO DO THE BEST JOB FOR YOU IN Pressure Lubrication



MODEL L—Mechanically sealed pumps. Ask for Catalog 101

MODEL C—General purpose pumps. Ask for Catalog 102

MODEL R—Automatic reversing pumps. Ask for Catalog 105

MODELS S and SA—Stripped pumps. Ask for Catalog 106

TUTHILL Simplifies Pump Selection for your Application

As the leader in pumps for pressure lubrication service, Tuthill offers a complete line of rotary, internal-gear, positive displacement pumps to take care of any possible application. The Tuthill line includes models for standard requirements, automatic reversing types and stripped pumps for built-in applications. To make it easy for you to select the pump best-suited to your needs, Tuthill catalogs are available covering each series of pumps, as listed below.

Write for the Catalog that fits your application

Ask for Catalog 101 on Model L series if your needs call for ⅓ to 6 g.p.m. at pressures to 600 p.s.i.

Ask for Catalog 102 on Model C series if your needs call for 2 to 200 g.p.m. at pressures to 100 p.s.i.

—Ask for Catalog 105 on Model R (automatic reversing) series—from ¾ to 200 g.p.m. at pressures to 400 p.s.i.

Ask for Catalog 106 on Models S and SA stripped pumps for built-in applications —from ⅓ to 200 g.p.m. at pressures to 200 p.s.i.

TUTHILL PUMPS FOR THE PURPOSE

TUTHILL PUMP COMPANY

Dependable Rotary Pumps since 1927

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Ingersoll, Ontario, Canada

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Post Scripts of Industry
continued

cago was promoted to assistant general sales manager in charge of staff sales functions.

Paul D. Sullivan was named assistant sales manager of **Le Roi Division, Westinghouse Air Brake Company.**

John S. Tunnell will take charge of product finishing at **The Wayne Pump Company** of Salisbury.

John D. Russell, formerly manager of engineering, has been named vice president, engineering, of the **Joy Manufacturing Company.**

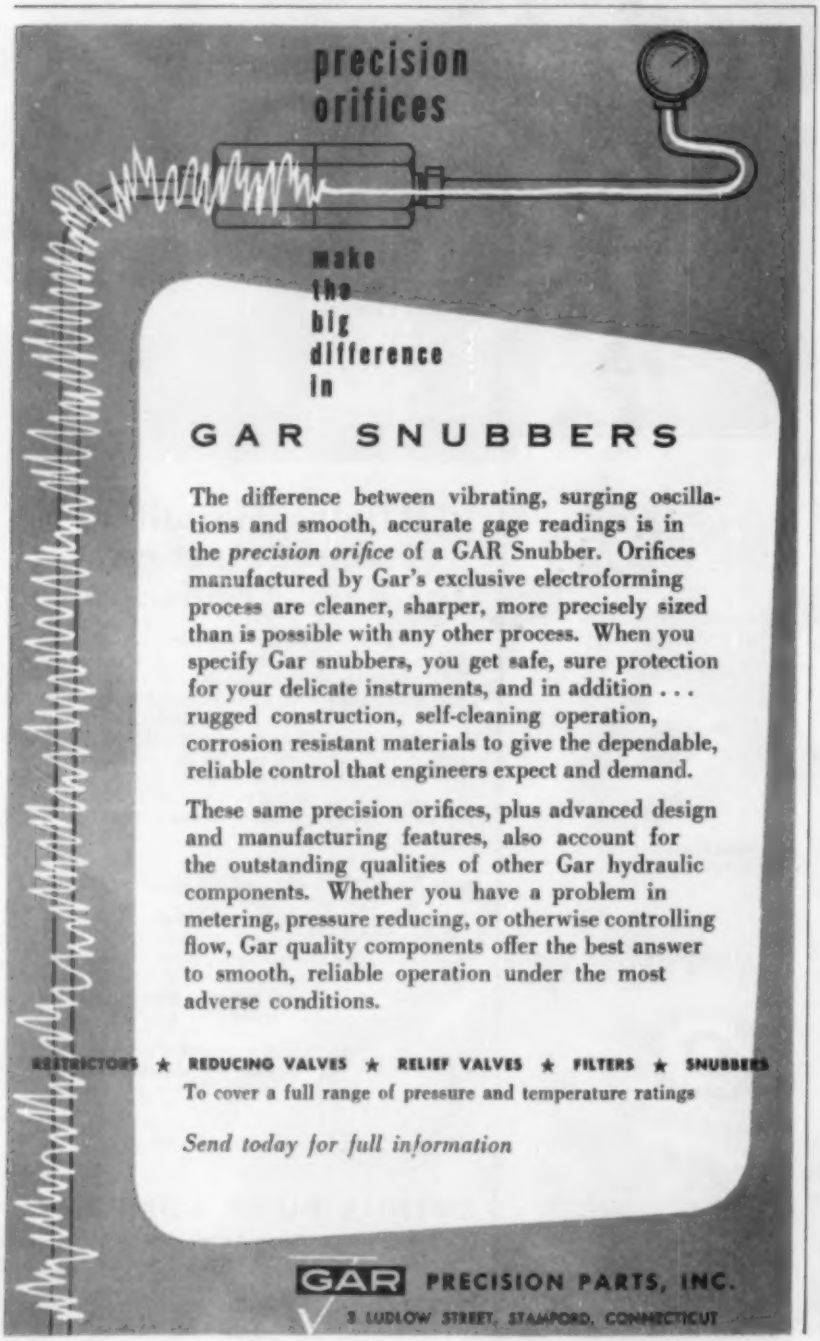
William J. Herrmann has become factory manager of **Vicker's Incorporated,** Detroit plant. Herrmann, who joined the company in 1946, was, prior to receiving his new assignment, administrative assistant to the vice president, production.

William J. Herrmann
Vickers Incorporated

Arthur J. Droge
Greer Hydraulics, Inc.

Arthur J. Droge was named as assistant sales manager for **Greer Hydraulics, Inc.** He will assist in sale and promotion of aviation and industrial test equipment.

Republic Manufacturing Co., have moved to new modern quarters at 15655 Brookpark Road, Cleveland, Ohio, doubling their floor space. Also announced were the following distributors: **Power Transmission Co.,** South Bend, Indiana; **Air Engineering & Supply Co.,** Minneapolis, Minn.; **Leinart Engineering**


precision
orifices
make
the
big
difference
in
GAR SNUBBERS
The difference between vibrating, surging oscillations and smooth, accurate gage readings is in the *precision orifice* of a GAR Snubber. Orifices manufactured by Gar's exclusive electroforming process are cleaner, sharper, more precisely sized than is possible with any other process. When you specify Gar snubbers, you get safe, sure protection for your delicate instruments, and in addition . . . rugged construction, self-cleaning operation, corrosion resistant materials to give the dependable, reliable control that engineers expect and demand.
These same precision orifices, plus advanced design and manufacturing features, also account for the outstanding qualities of other Gar hydraulic components. Whether you have a problem in metering, pressure reducing, or otherwise controlling flow, Gar quality components offer the best answer to smooth, reliable operation under the most adverse conditions.
RESTRICTORS ★ REDUCING VALVES ★ RELIEF VALVES ★ FILTERS ★ SNUBBERS
To cover a full range of pressure and temperature ratings
Send today for full information
GAR PRECISION PARTS, INC.
3 LUDLOW STREET, STAMFORD, CONNECTICUT

Co., Atlanta, Ga.; and **Flow Engineering & Sales Co.**, Birmingham, Alabama.

Stanley M. Proctor announced the forming of the **Stanley M. Proctor Company,** 1900 Euclid Avenue, Cleveland. The company will handle a complete line of industrial and pneumatic controls and will operate in the Lorain, Cuyahoga, Lake and Ashtabula Counties. Proctor has been associated with the fluid power industry for several years.

Quaker Rubber Corporation, Division of H. K. Porter Company, Inc. appointed **A. J. Lamond** as manager of Packing Sales.

Cook Electric Company opened a Northwest district office in Seattle, Washington. **Martin J. Poggie** was named district manager.

Russell T. Lowe was promoted to assistant chief engineer of the Barry Corporation. With the company for three years, he will be responsible for all operating functions of the engineering department, including product development and design.

Loewy-Hydropress has appointed **Roy D. Palmer** as industrial consultant. Formerly associated with the Aluminum Company of America, Palmer is internationally recognized as an authority in the design, construction and operation of rolling and extrusion plants.

Dr. James T. Eaton was elected to the newly created position of vice president—production of **E. F. Houghton & Co.** Eaton, who joined Houghton in 1937, was formerly director of research and was elected to the board of directors in 1950. He will now be responsible for the company's oil manufacturing plants and continue to head the research staff. **Herbert M. Michael,** plant engineer, has become responsible for the

Continued on next page

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a
single cylinder

FOR AIR OPERATION OR STANDARD 1000 P. S. I. OIL SERVICE

Complies with BOTH J. I. C. Pneumatic and J. I. C. Hydraulic Standards!

- New Series "S" Hydro-Line Cylinders
- 95% efficient at 100 PSI air pressure
- 98% efficient at 1,000 PSI oil pressure
- The standard Automation Cylinder of the Automotive Industry
- Compact, flexible design
- Advanced design of cushions in the Series "S" make it possible to use the full stroke on these cylinders at higher speeds and loads than the conventional type.

Write today for FREE catalog

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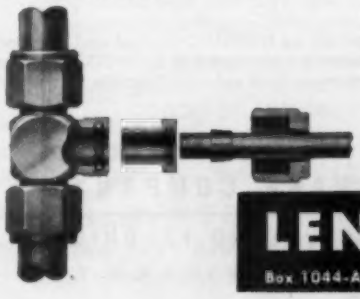
5605 PIKE ROAD • ROCKFORD, ILLINOIS

LENZ "O-RING" TUBE FITTINGS

ELIMINATES
FLARING,
THREADING,
WELDING,
SOLDERING

A HACKSAW AND FILE IS ALL YOU NEED

Excessive wrench torque is unnecessary for seal does not depend upon tightness of the nut. Nut fits loosely on the tube for ease of assembly. The higher the pressure the tighter the grip. LENZ FITTINGS are ideal for quick, simple, easy to assemble, leak-proof connection — for steel or copper tubing — on air and hydraulic systems.



DO YOU KNOW ABOUT LENZ REDUCER COUPLINGS?

Reducer couplings are adapters for standard bodies, making possible line reductions on any leg by use of standard adapters and adapter nuts.

LENZ COMPANY

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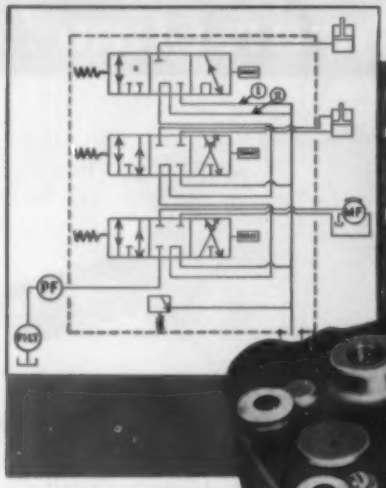
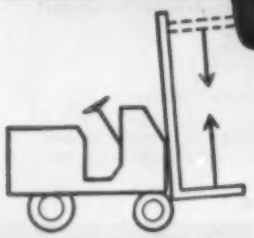
Your Hydraulic Circuit in a Nutshell with a

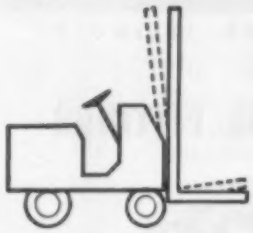


HYDRECO HOLLOW PLUNGER CONTROL VALVE

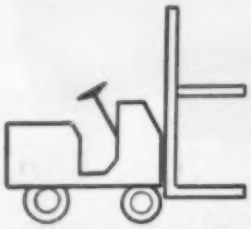
V-13 Series 3 Plunger Valve with piston-type Relief Valve. Location of ports and controls reversible. Available 1 to 5 plungers...5 to 80 gpm.



Raise or lower the load with throttled smoothness . . . hold it at any point with no "sag" or drop.



Tilt the platform forward or back quickly and without shock while standing still or in motion.



Hold the load securely clamped . . . or provide other lateral or rotary motion time and labor-saving functions.

Reducing the "spaghetti" in a circuit is heads-up engineering, but this is just one of the many advantages you enjoy with HYDRECO Control Valves. What can a valve do for you? What have you a right to expect of a hydraulic valve? HYDRECO answers these questions with definite performance history that shows how your machines can do more – *Quickly – Precisely* and *Dependably!* You put *complete* control at the fingertips of the operator when your equipment features –

HYDRECO *Oil Power!*

Earth Moving and Materials Handling operations probably represent the most rigorous service hydraulic components are called upon to perform. It is significant that HYDRECO Valves, Pumps, Motors and Cylinders are the most frequently used in these fields. To improve the performance of existing equipment or to add functions and complete dependability to projected designs – get all the facts on HYDRECO Oil Power.

Write for full information on HYDRECO Control and Auxiliary Valves . . . accept the assistance of HYDRECO engineers and their experience in developing "circuits that work".

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THE NEW YORK AIR BRAKE COMPANY
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INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

Post Scripts of Industry
continued

company's works engineering department and **Joseph G. MacCracken,** development engineer, will supervise the development engineering edpartment, the hydraulic development department and the leather inspection department.

Fielden Instrument Division of Robertshaw-Fulton Controls Company named the following sales representatives: **A. W. Roat** will cover northern half of Ohio and counties in northwest Pennsylvania. **Electro Products, Inc.,** Indianapolis and **Broger Instrument Sales Company, Inc.,** Boston.

Rae S. Carson has been named district manager of the east central territory with headquarters in Cincinnati, for the **Oilgear Company. Enoch D. Davies** in Cincinnati, **Otto F. Klieve** and **Gilbert W. Uecker** in Cleveland will assist Carson as field engineers.

Rae S. Carson
The Oilgear Company

Teer, Wickshire & Company announced the establishment of a fluid power division, to develop and manufacture products in the industrial hydraulic and pneumatic field. **Griffith W. Lindsay,** is chief engineer of this newly created division.

Conoflow Corporation appointed two new sales engineering representatives. **The Williams Equipment Co.,** New Orleans,

Louisiana, will service southeastern Louisiana and southern Mississippi. **Engineered Instrument Sales Company,** Memphis, Tennessee will cover western part of Tennessee, northern half of Mississippi and eastern portion of Arkansas.

Ajax Flexible Coupling Co., Inc., named **Howard S. Gans,** Cincinnati, as sales representative. **F. E. Hapgood** has been appointed production manager.

Jesse A. Giles was promoted to manager of **A. Schrader's Son Division** of Scovill Manufacturing Co., Inc., Toronto plant. **Donald H. Storey** was named assistant manager.

Donald H. Storey
A. Schrader's Son

Jesse A. Giles
A. Schrader's Son

Owen C. Davis was appointed as controller, **Floyd Johnson** as manager of the general accounting department of **Vickers Incorporated. Marguerite Mayne** was named administrative assistant to the treasurer.

Continued on page 159

A New High Pressure Pump at a Low Pressure Price

The DUDCO PV-600 Series Variable Delivery Pumps give designers and users a source of Fluid Power that sets new standards of efficiency, flexibility, performance AND economy. Design features eliminate excessive heat . . . major cause of accelerated wear, bearing failure and pump deterioration. And, these pumps operate with maximum performance with an exceptionally wide range of hydraulic fluids . . . oils, synthetics and non-flammables.

Available in Pressure Compensated and Hand Wheel Control types. The PVC Models provide integral pressure control where regulation is achieved within the pump itself. At zero flow, the pump operates at normal speed and maintains holding pressure with negligible power consumption. The PVM Models incorporate a manually operated flow regulator that affords accurate adjustment of delivery between the limits of full flow and zero flow. Output of this pump can be speedily adjusted to meet the flow requirements of the machine being operated.

Get all the facts on this PV-600 Series. Write for Bulletin DP-350 and other new developments in DUDCO DUAL-VANE PUMPS and MOTORS.

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THE NEW YORK AIR BRAKE COMPANY
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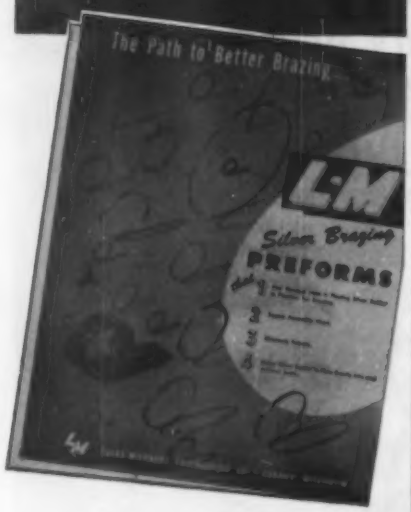

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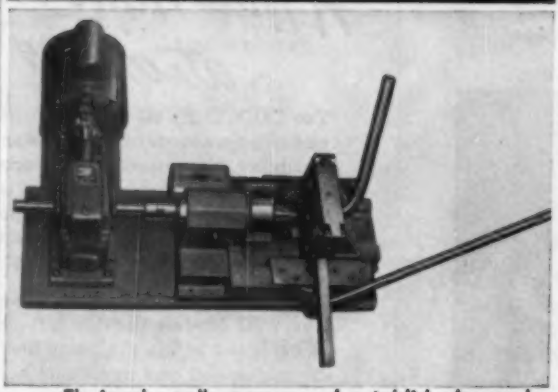
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1927

"POWER-FLARE"



Flaring by roll process and established speed, the "Power-Flare" machine has greatly improved the flare of all types of tubing used in hydraulic systems.
It gives a smooth, always uniform, surface for seating; the metal is not work hardened near the danger point; and by creating a burnished surface, tool marks, scratches and burrs are eliminated.

One size machine flares steel, copper, aluminum and stainless steel from 3/8" OD. to 2" OD. Dies for 30, 37 and 45 degree angle fittings are available.

Numerous users have expressed complete satisfaction. "Power-Flare" has been proven in the field for over five years.

Immediate delivery.

COX Engineering and Sales Company
3022 E. Canfield, Detroit 7, Mich., Phone WAlnut 1-3094

Post Scripts of Industry
continued

Logansport Machine Company, Inc., appointed **E. L. Kimes,** vice president and treasurer; **L. L. Austin,** vice president and secretary.

W. L. Rodgers and **W. P. Spencer** have been named to a new district sales office of the **National Motor Bearing Company, Inc.,** opened in Indianapolis. Both were formerly with the Chicago district sales office.

Wales-Strippit Corporation appointed **Chesley Somerton** as assistant sales manager. He was previously associated with Wales-Strippit of Canada, Ltd.

Chesley Somerton
Wales-Strippit Corporation

The I.R.E. Materials Symposium will be held June 2-3, at Convention Hall, Philadelphia.

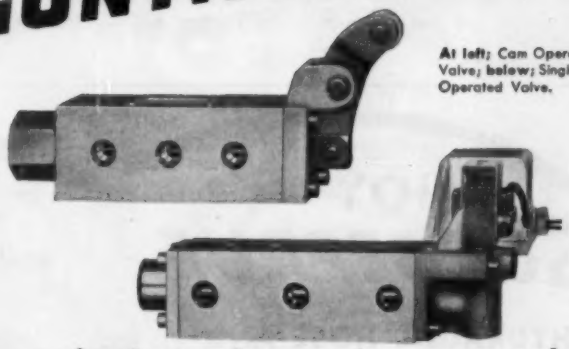
Sterling Electric Motors, Inc., appointed **Charles E. Cotham, Jr.,** as district manager for the Houston, Texas area.

United States Rubber Co. purchased a four acre site in Cincinnati, to build a new branch office and warehouse. New branch will be a one-story brick building with 100,000 square feet and will have all modern facilities.

Reorganization of the top executive staff of **Morse Chain Co.,** a Borg Warner Corp. subsidiary operating plants in Ithaca, N. Y. and

Continued on next page

SELECT Quick-As-Wink® AIR AND HYDRAULIC CONTROL VALVES



At left; Cam Operated Type "O" Valve; below; Single Solenoid Pilot Operated Valve.

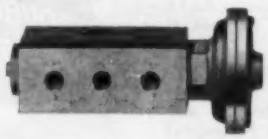
They're designed to give you the fast dependable trouble-free action you need

for single or sequence machine movements

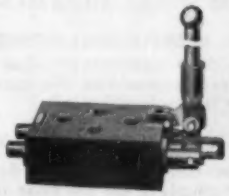
• Those successive and inter-related machine operations — that speed manufacture and cut costs — can only be as successful as the air and hydraulic valves that control the operations. Specify Quick-As-Wink Control Valves.

Positive and fast acting, Quick-As-Wink valves are designed and built to meet the most exacting requirements. They will deliver dependable and precision performance month after month, and year after year. Many superintendents and foremen have found that there is nothing better than a Quick-As-Wink valve. Can you afford to gamble with less? Get full details. Write for Bulletin No. 531 today!

Ask us also about . . .



DIAPHRAGM OPERATED "O-TYPE" VALVE, diaphragm can be actuated with instrument air as low as 12 to 15 psi.



LEVER OPERATED HYDRAULIC VALVE suited for water or hydraulic oils up to 5000 psi. 2-way, 3-way and 4-way actions.

Quick-As-Wink AIR AND HYDRAULIC Control Valves

Hand, Foot, Cam, Pilot, Diaphragm and Solenoid Operated

Mfd. by C. B. HUNT & SON, INC., East Pershing St., Salem, Ohio

Post Scripts of Industry
continued

Detroit has been announced. **Louis Paul Smith,** who was vice president and Ithaca plant manager was named vice president of manufacturing of the entire company. **M. V. Bailliere** has become responsible for all finances of the company. **Norman C. Bremer,** previously chief engineer at Ithaca, takes on additional duties of chief engineer at Detroit plant. Also announced was the formation of a new manufacturing subsidiary of Borg Warner Corp., **Morse Chain of Canada, Ltd.** The new company will occupy a plant to be built at Simcoe, Ontario.

Appointment of **George G. McKhann** as special aircraft valve application engineer to be based at **Vickers Incorporated,** California facility, was announced. He will assist in analysis and development of special hydraulic flight control and similar servo systems.

George G. McKhann
Vickers Incorporated

E. F. Houghton & Co. has promoted **Dr. Kurt C. Frisch** to assistant manager of research. He was previously supervisor of organic research at the Houghton Laboratories. He will be succeeded in that position by **Dr. Ellis Abrams.**

Frank C. Zeis joined the **Darling Valve and Manufacturing Company** to handle sales in the St. Louis area. **Leon A. Hoffmeister,** sales engineer, was transferred to Darling's New York offices. **Lewis M. Poag** will handle sales in the Cincinnati area, and **B. F. Marcin** was transferred to greater responsibilities in Pittsburgh. Also announced was the establishment of a new sales office in Chicago, headed by **B. E. Engstrom,** Midwest sales manager.

George E. Bowdoin has joined **Worthington Corporation** as assistant to the president. He was a former president of U.S. Hoffman Machinery Corporation. **Clarence S. Wentworth** of the

3 Big Advantages for Your Hydraulic Assemblies

PERMITS THE USE OF MORE ABRASION-RESISTANT, RUBBER-COVERED HOSE

Insure longer wear in your hydraulic hose assemblies —and at the same time, save assembly time by avoiding old-fashioned skiving. Joy Surgepruf re-usable couplings make *both* advantages possible. Their exclusive "double-wedge" grip lets you use tough, abrasion-resistant, rubber-covered hose instead of the braided type—without any need for skiving the hose at the connection.

NO SPECIAL ASSEMBLY TOOLS REQUIRED

You need no mandrels or other special tools to make up Surgepruf assemblies. No extra expense or special technique is involved.

CAN BE RETIGHTENED WHEN LOOSE ON THE HOSE

Machine vibration or hose flexing can loosen any hydraulic coupling on the hose in time, but Surgepruf Couplings can be easily, quickly retightened on the job to stop a leak—*another* exclusive feature.

Surgepruf Hose Couplings are made to JIC Standards. Assemblies are available in many sizes and lengths, and in both single and double-wire reinforced types for medium-high and high pressure service respectively.

Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.

Get complete data on Surgepruf:
WRITE FOR BULLETIN H-100b
Consult a Joy Engineer

JOY
HYDRAULIC ASSEMBLIES THAT GIVE YOU MAXIMUM RELIABILITY

W&D H5514

Corporation's Detroit district office was promoted to Central Region sales manager. He succeeds **William A. Meiter** who has become general sales manager.

Parker Appliance Company appointed **General Sales, Inc.,** Amarillo, Texas, as a tube fitting distributor. **Vincent Brass & Copper Company,** Minneapolis, Minn., will distribute fittings and hydraulic hose assemblies **Haskel Engineering Supply Company** will be exclusive distributor in California for Parker's hydraulic equipment.

Dr. Franklin E. Lowance was appointed director of research and engineering for **Westinghouse Air Brake Company.** He will direct the company's program and coordinate research and engineering activities of all subsidiaries and divisions.

Dr. Franklin E. Lowance
Westinghouse Air Brake Co.

Ross Engineering Company, Chicago, Illinois and **A. N. Dunn,** South Bend, Indiana, have been appointed representatives of the **R. P. Adams Company, Inc.**

W. W. Stewart has been appointed controller of **The Peerless Electric Company.** He was previously with the National Screw and Manufacturing Co.

Edgar C. Wagner, vice president, **The Weinman Pump & Supply Company,** was pro-

Continued on next page

LET US QUOTE ON YOUR TUBING AND FABRICATION NEEDS

Avon single wall steel tubing is successfully supplanting other types of tubing—aluminum, brass, copper and steel—with equal or improved reliability of performance and really impressive economies.

Avon's High Frequency Fusionweld process insures a much higher degree of tensile strength, greater resistance to vibration and fatigue, extreme ductility, plus greatly improved adaptability in producing the most critical tube forms—such as beading, bending, coiling, flaring, knurling, slotting, piercing, threading and swaging without cracking, tearing or checking.

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Chassis tubes
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Choke controls
Oil return lines
Dip stick tubes
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Automatic transmission

FARM EQUIPMENT
Hydraulic lifting devices
Support tubes
Lubrication lines
Fuel lines
Fuel manifolds

ELECTRICAL
Ceiling & wall fixtures
Lamp tubes
Heating elements
Radio & TV antennae

HEATING
Oil & gas lines
Pilot tubes
Flash tubes
Pot burner tubes
Fuel tank tubes

TOYS—FURNITURE
Scooter & wagon parts
Spacers
Pop guns
Bicycle parts
Mechanical toys
Tables
Chairs
Swings
Baby carriages, cribs, car seats and beds

MISCELLANEOUS
Umbrellas
Display boards
Panels
Conveyor oil lines
Lawn mower handles
Hose reels

AVON TUBE DIVISION
HIGBIE MANUFACTURING CO.
ROCHESTER MICHIGAN

Post Scripts of Industry
continued

moted to executive vice-president. **C. Dana Chalfant,** general manager, was elected vice president and **Robert E. Lancaster,** chief engineer, was elected vice president—engineering.

Micro Switch, a division of Minneapolis-Honeywell Regulator Company, has opened a new assembly plant in Independence, Iowa. The new plant will enable the company to expand its production and add some new products to its present lines.

Aeroquip Corporation, through a newly formed Canadian subsidiary, **Prenco-Aeroquip Ltd.,** has acquired all of the assets of Prenco Progress and Engineering Corp., Toronto, Canada. Prenco is a former licensee of Aeroquip. Prenco-Aeroquip Ltd., will temporarily use the same quarters as Prenco, but at a later date contemplates to move operations to larger and more efficient facilities.

Greer Hydraulics, Inc., appointed **Lyman A. Bullard, Jr.,** as manager of the newly established Flight Safety Products department. He will direct development and marketing of these products. Before poining Greer, Bullard was director of spares for Republic Aviation Corporation.

Lyman A. Bullard Jr.
Greer Hydraulics, Inc.

Warren H. Brand
Conoflow Corporation

Warren H. Brand has been elected vice president in charge of engineering and research of **Conoflow Corporation.** Prior to joining the company in 1945 as director of engineering and research, Brand served with the Atomic Energy Commission. Also announced

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CUSTOM DEVELOPMENT AND FABRICATION SINCE 1916
1535 S. TENTH ST. GOSHEN, IND.

was the opening of a new Conoflow New York sales engineering office. **Charles P. Boyd** was appointed branch manager who will be assisted by **Joseph Bowler,** serving as district sales engineer.

Raymond E. Dewey was promoted to manager of operations of **Ohio Seamless Tube Division** of Copperweld Steel Company. With the organization for 29 years, Dewey was formerly chief engineer. Reid Pittinger was named manager of industrial relations.

Raymond E. Dewey
Ohio Seamless Tube Div.

R. G. Allen, president and general manager of **Pesco Products Division,** Borg-Warner Corporation, announced appointment of **J. M. Vinicombe, Jr.** as director of industrial relations. He was previously associated with Radio Corporation of America.

Robert B. Wilson
Minnesota Rubber and Gasket Company

Robert B. Wilson was appointed sales engineer for **Minnesota Rubber and Gasket Company.** His territory will cover the New England States and parts of New York and New Jersey.

Keep YOUR HYDRAULIC SYSTEM Clean with HILCO HYDRAULIC OIL FILTER

- No More Varnish and Sludge Deposits
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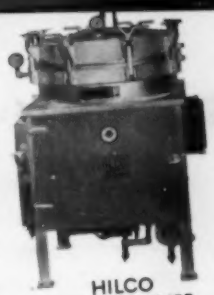

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For complete oil reclaiming. Removes solids, acids and volatile impurities; moisture, solvents, gasses, etc., from hydraulic fluids by heat-vacuum process.

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for complete Nationally-advertised line of Air, Hydraulic Cylinders, Valves, Packaged Devices, by established Western manufacturer. Territories open in Southeastern, South Central, Intermountain and Northwestern States, Indianapolis area and East Texas. Fluid power sales experience preferred. For details of profitable, long range plan write Box 3255 APPLIED HYDRAULICS.

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Progressive company has outstanding opportunity for engineer capable of designing hydraulic equipment for farm machinery. This is a career opening.
Send details of your experience and requirements to:
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For design and development work on Aircraft Hydraulic Valves. Qualifications desired: B.S. Degree in Eng.; at least 8 years. Eng. exp. including 3 yrs. in Hydraulics.
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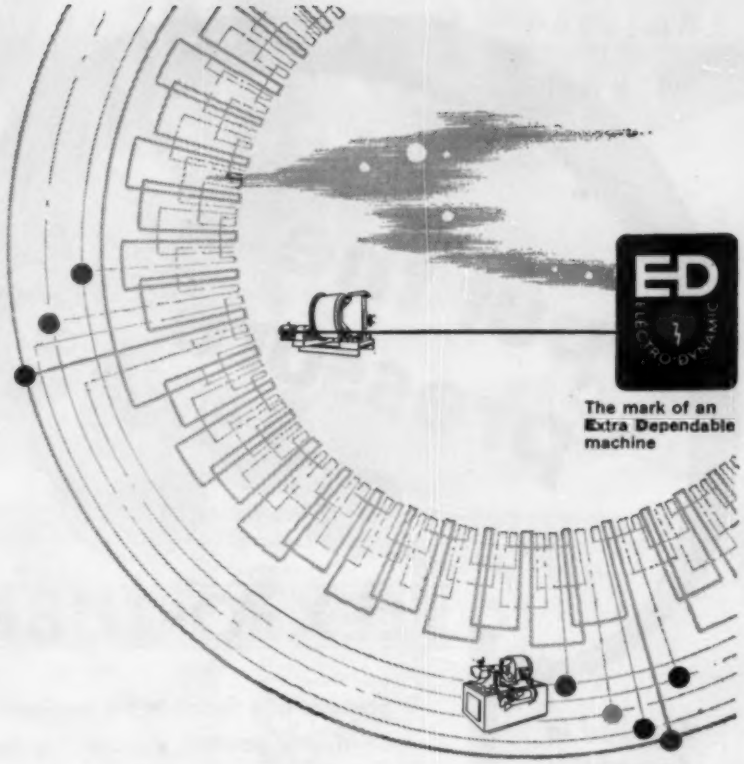

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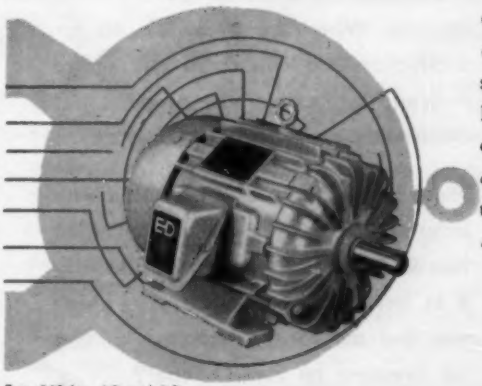

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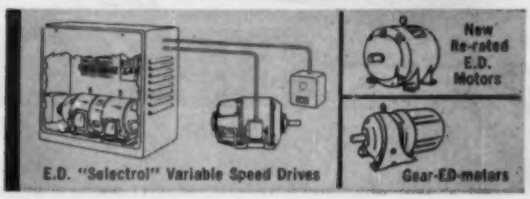

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Flex-O-Tube will help you determine the assembly needed or work to your own specifications. In either case, modern facilities and latest inspection techniques assure you a uniformly high quality product delivered promptly.

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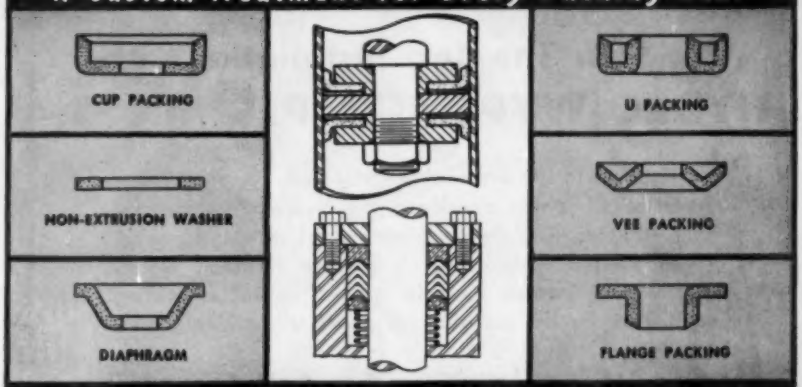
616:

312:

A Custom Treatment for Every Packing Job!



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Makes very fine cups, vees, "U" packings, flange packings and non-extrusion back-up washers.

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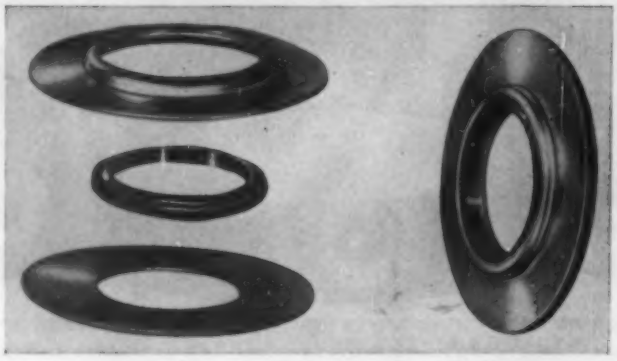

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★ Hydro-Wypes available 5/16" to 30" Dia.

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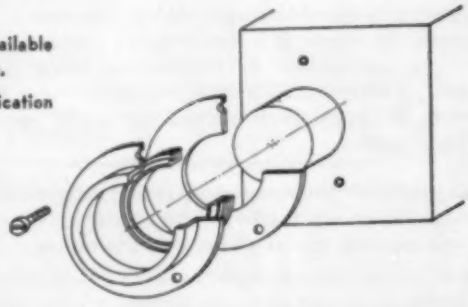

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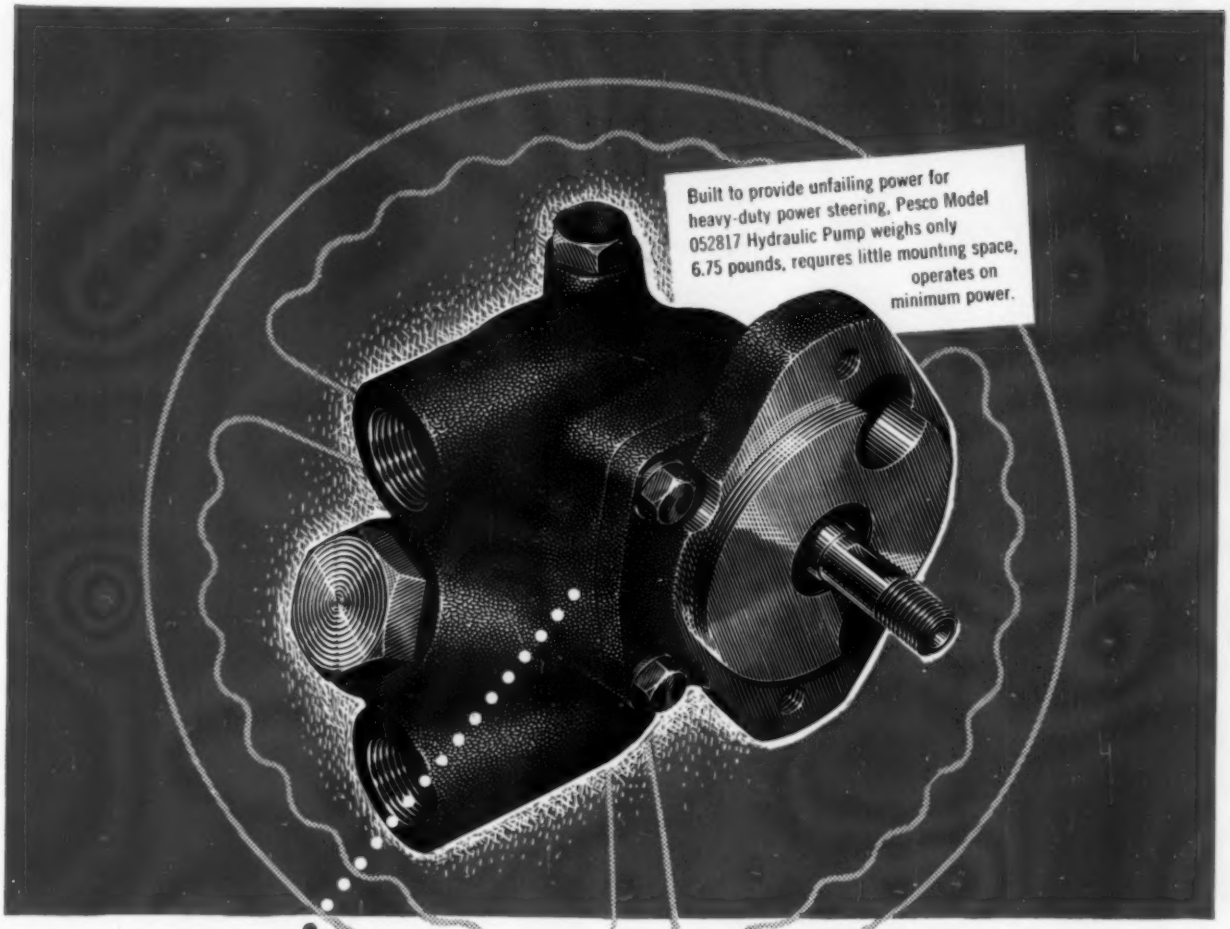
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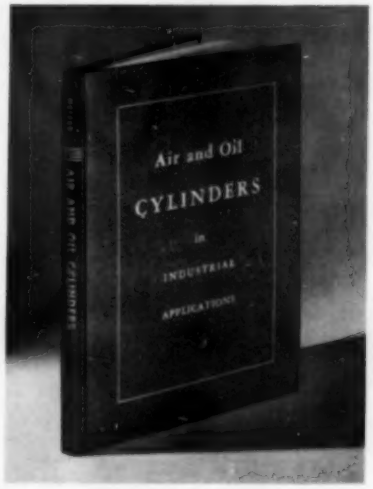

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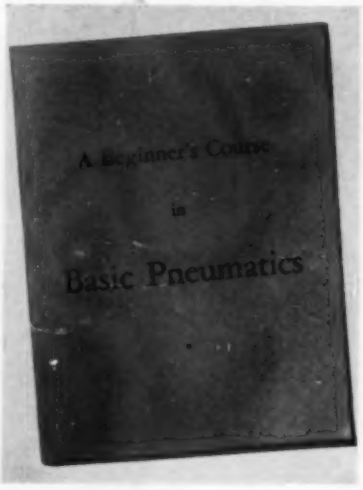

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